AP CALCULUS FIVES

F #88 Worksheet #39

I 1. For what value of x does the function $f(x) = (x - 2)(x - 3)^2$ have a relative maximum?

A) -3 B) $-\frac{7}{3}$ C) $-\frac{5}{2}$ D) $\frac{7}{3}$ E) $\frac{5}{2}$

2. If $f(x) = \left(x^2 - 2x - 1\right)^{2/3}$, then $f\,'(0) =$ A) $\frac{4}{3}$ B) 0 C) $-\frac{2}{3}$ D) $-\frac{4}{3}$ E) -2

V p.244 (22)

E 1. Determine the absolute maximum and minimum of a function.

S Find all absolute and relative maxima and minima, terrace pts, and inflection pts:

1. $y = x^3 - 3x + 2$ on $[0,2]$ 2. $y = x^3 - 12x + 1$ on $[-3,5]$ 3. $y = x^3 - 2x^2 + x$ on $[-1,2]$

4. $y = x^3 + 3x^2 - 24x + 20$ on $[0,5]$.

F #89 Worksheet #40

I 1. How many critical points does the function $f(x) = (x + 2)^5(x - 3)^4$ have?

A) One B) Two C) Three D) Five E) Nine

2. The slope of the line <u>normal</u> to the graph of $y = 2\ln(\sec x)$ at $x = \frac{\pi}{4}$ is

A) -2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 2 E) nonexistent

V p.246 (45a) Show all work.

E 1. Continue review of curve sketching. 2. 1st and 2nd fundamental theorems of calculus.[2nd is only new material] 3. Finding vertical and horizontal asymptotes.

S 1. Find $F'(x)$ if $F(x) = \int_4^x 3\sin t^2\,dt$ 2. Find the maximum value of $y = -x^2 + 4x + 25$. Why is it not necessary to say absolute maximum nor have interval in this problem? 3. Find all vertical and horizontal asymptotes, holes, x- and y-intercepts, and sketch the curve:

$$y = \frac{x^2 - 3x + 2}{x^2 - 4x + 3}$$

F #90 Worksheet #41

I 1. If $y = -\frac{x^3}{3} - x^2$, then the value of $\frac{d^2y}{dx^2}$ when $x = \frac{1}{2}$ is

A) -1 B) $-\frac{5}{4}$ C) $\frac{49}{576}$ D) -5 E) -3

2. What is the maximum slope of the curve $y = -x^3 - 3x^2 + 24x + 3$?

A) 31 B) -77 C) 15 D) 27 E) -23

V If $f(n + 1) = \frac{2f(n) + 1}{2}$ and $f(1) = 2$, then $f(37) =$

E The next **scheduled** test is next week!!

S 1. The base of a solid is the region bounded by the two parabolas $y^2 = 4x$ and $x^2 = 4y$. Cross sections of the solid perpendicular to the x-axis are semicircles. Find the volume of the solid.

2. A solid 3 cm long has its tip at the origin and goes along the x-axis. When cut perpendicular to the x-axis, the cross section is an isosceles right triangle whose congruent sides have a length equal to 4 times the distance of the cut from the origin as measured on the x-axis. Find the volume of the solid.

AP CALCULUS FIVES

F #91 Worksheet #42

I 1. At what value of x does the graph of $y = \frac{1}{x^2} - \frac{1}{x^3}$ have a point of inflection?

A) 0 B) 1 C) 2 D) 3 E) At no value of x

2. If $f(x) = \sin\left(\frac{x}{2}\right)$, then there exists a number c in the interval $\frac{\pi}{2} < x < \frac{3\pi}{2}$ that satisfies the conclusion of the Mean Value Theorem.

Which of the following could be c ? A) $\frac{2\pi}{3}$ B) $\frac{3\pi}{4}$ C) $\frac{5\pi}{6}$ D) π E) $\frac{3\pi}{2}$

V p 246 (46)

E 1. Review for upcoming test. 2. The test will cover volumes, curve analysis with first and second derivatives, Maximum and Minimum problems including Absolute Maximum and Minimum, asymptotes, and the 2nd Fundamental Theorem of Calculus (and other stuff!!).

S Get ready for the test! Know the concepts, not just the mechanics.

F #92 Worksheet #43

I 1. How many ways can you arrange five different books on a shelf?

2. Out of a group of 10 people, how many different 3-person committees can be formed?

V On the closed interval [0, 2p], the maximum value of the function $f(x) = 4 \sin x - 3 \cos x$ is

A) 3 B) 4 C) $\frac{24}{5}$ D) 5 E) none of these

E Review for the upcoming test!

S Be prepared!!!!!!!! Something special is in the air!!!!!

F #93 Worksheet #44

I 1. How many different 5-letter words can you make from the letters in the word **CONSUMER**?

2. In a class of 36 students, how many different 3-person committees can be formed?

V A relative minimum value of the function $y = \frac{e^x}{x}$ is A) $\frac{1}{e}$ B) 1 C) -1 D) e E) 0

E 1. Getting ready for tomorrow's test

S Lots of notes problems.

F #94 Worksheet #45

I 1. Let f be the function defined by $f(x) = \begin{cases} x^3 \text{ for } x \le 0 \\ x \text{ for } x > 0 \end{cases}$

Which of the following statements about f is true?

A) f is an odd function B) f is discontinuous at $x = 0$

C) f has a relative minimum D) $f\,'(0) = 0$ E) $f\,'(x) > 0$ for x ? 0

2. Let R be the region in the first quadrant enclosed by the graph of $y = (x + 1)^{1/3}$, the line $x = 7$, the x-axis, and the y-axis. The volume of the solid generated when R is revolved about the y-axis is given by: A) $\pi \int_0^7 (x + 1)^{2/3}\,dx$ B) $2\pi \int_0^7 x(x + 1)^{1/3}\,dx$

C) $\pi \int_0^2 (x + 1)^{2/3}\,dx$ D) $2\pi \int_0^2 x(x + 1)^{1/3}\,dx$ E) $\pi \int_0^7 (y^3 - 1)^2\,dy$

V p.273(12)

AP CALCULUS FIVES

E 1. **Take an easy test on curve analysis and volumes**.
2. Read about the relationship between distance, velocity, and acceleration.

F #95 (Free Response: show all work) A particle moves along the x-axis in such a way that its acceleration at time t for $t > 0$ is given by $a(t) = \frac{3}{t^2}$. When $t = 1$, the position of the particle is 6 and the velocity is 2.

a) Write an equation of the velocity, v(t), of the particle for all $t > 0$.
b) Write an equation for the position, x(t), of the particle for all $t > 0$.
c) Find the position of the particle when $t = e$.

I 1. A particle moves along a line so that at time t, where $0 \le t \le \pi$, its position is given by $s(t) = -4 \cos t - \frac{t^2}{2} + 10$. What is the velocity of the particle when its acceleration is zero?

A) –5.19 B) 0.74 C) 1.32 D) 2.55 E) 8.13

2. The point on the curve $y = \sqrt{2x+1}$ at which the normal is parallel to the line $y = -3x+6$ is

A) (4, 3) B) (0,1) C) $(1,\sqrt{3})$ D) (4,–3) E) $(2,\sqrt{5})$

V The velocity of a particle moving on a line is $v = t^{-1/2} + 3t^{1/2}$. What is the average velocity of the particle from $t = 0$ to $t = 9$?

E 1. Learn relationship between displacement, velocity, and acceleration.
2. Apply differential and integral calculus to find the numerical values of these relationships.

S In problems 1 – 3, a particle moves along a horizontal line according to the law for $t = 0$ $s = t^4 - 6t^3 + 12t^2 + 3$

1. The particle is at rest when t is equal to

A) 1 or 2 B) 0 C) $\frac{9}{4}$ D) 0, 2, or 3 E) none of these

2. The velocity, v, is increasing when

A) $t > 1$ B) $1 < t < 2$ C) $t < 2$ D) $0 \le t < 1$ or $t > 2$ E) $t > 0$

3. The acceleration, a, is positive when

A) $t > 1$ B) $1 < t < 2$ C) $t < 2$ D) $t > 0$ E) $0 \le t < 1$ or $t > 2$

4. If a particle moves along a line according to the law $s = t^5 + 5t^4$, then the number of times it reverses direction is

A) 0 B) 1 C) 2 D) 3 E) 4

AP CALCULUS FIVES

F #96 **In your book:** p.141 (10, 20) **also, the following:**

1. The acceleration at time $t > 0$ of a particle moving along the x–axis is $a(t) = 3t + 2$ ft/sec^2. If at $t = 1$ seconds the velocity is 4 ft/sec and the position is $x = 6$ ft, then at $t = 2$ seconds the position $x(t)$ is
   A) 8 ft B) 11 ft C) 12 ft D) 13 ft E) 15 ft
2. A particle moves along the x–axis so that at time t its position is given by $x(t) = (t+1)(t-3)^3$. For what values of t is the velocity of the particle increasing?
   A) all t B) $0 < t < 1$ C) $0 < t < 3$ D) $1 < t < 3$ E) $t < 1$ or $t > 3$
3. For $x \neq 0$, the slope of the tangent to $y = x \cos x$ equals zero whenever
   A) $\tan x = -x$ B) $\tan x = \frac{1}{x}$ C) $\tan x = x$ D) $\sin x = x$ E) $\cos x = x$
4. An equation of the line tangent to the graph of $y = x^3 + 3x^2 + 2$ at its point of inflection is
   A) $y = -3x + 1$ B) $y = -3x - 7$ C) $y = x + 5$ D) $y = 3x + 1$ E) $y = 3x + 7$

I 1. Suppose $F(x) = \int_0^{x^2} \frac{1}{2 + t^3}\, dt$ for all real x, then $F'(-1) =$
   A) 2 B) 1 C) $\frac{1}{3}$ D) -2 E) $-\frac{2}{3}$

2. If $f'(x) = \ln(x - 2)$, then the graph of $y = f(x)$ is decreasing if and only if
   A) $2 < x < 3$ B) $0 < x$ C) $0 < x < 1$ D) $x > 1$ E) $x > 2$

V Which of the following is an equation of a curve that intersects at right angles every curve of the family $y = x^2 + k$ for every real value of k?
A) $y = -x^2$ B) $y = -\frac{1}{x^2}$ C) $y = \frac{1}{x^2}$ D) $y = -\frac{1}{2} \ln x$ E) $y = \ln x$

E 1. Continue practice with problems involving s, v, and a.

S Getting organized!! Could something special be in your future?

F #97 Worksheet #46

I Probability and Statistics sheet: Day 1

V For all real numbers x, f is a differentiable function such that $f(-x) = f(x)$. Let $f(p) = 1$ and $f'(p) = 5$ for some $p > 0$, the find $f'(-p)$. (explain why!)

E Continue practice with problems involving s, v, and a.

S Getting organized!! Could something special be in your future?

F #98 Worksheet #47

I Probability and Statistics sheet: Day 2

V For all real numbers x, f is a differentiable function such that $f(-x) = f(x)$. Let $f(p) = 1$ and $f'(p) = 5$ for some $p > 0$, the find $f'(0)$. (explain why!)

E Finish up work on relationships between s, v, and a to prepare for upcoming test.

S If $x(t) = \frac{7}{2} e^{-4t} \sin(2t)$, find v(t) and a(t).

AP CALCULUS FIVES

F #99 Worksheet #48
I Probability and Statistics sheet: Day 3
V Find the equation of the parabola with vertex at (2,1) and focus at (2,0) Show all work.
E Let's all be ready and **just do it** on the upcoming test.
S 1. If a particle moves on a line according to the law $s = t^5 - 20t^3$, then the number of times it reverses direction is ___?___.
2. A particle moves along a line with acceleration $a = 2t - 1$. If, when $t = 1$, $v = -2$, then the total distance traveled between $t = 0$ and $t = 3$ equals ___?___.

F #100 Worksheet #49
I Probability and Statistics sheet: Day 4
V The areas of the sides of a rectangular box are 24, 32, and 48. Find the volume.
E Prepare for tomorrow's test that will stress s, v, and a.
S A particle moving along the x–axis starts at the origin when $t = 0$. Its acceleration at any time t is $a = -6t$. Find the velocity when $t = 0$ if the maximum displacement of the particle in the positive direction is 16 units.

F #101 **(You will need your book and your calculator!!!) Read p.260–266 in your textbook!!!**
1. In your book, page 266 (2)
2. In your book, page 266 (3) Find x_2 only if $x_0 = 1$.
3. (Copy question and show all work) A particle, initially at rest, moves along the x-axis so that its acceleration at any time $t = 0$ is given by $a(t) = 12t^2 - 4$.
The position of the particle when $t = 1$ is $x(1) = 3$.
   (a) Find the values of t for which the particle is at rest.
   (b) Write an expression for the position x(t) of the particle at any time $t = 0$.
   (c) Find the total distance traveled by the particle from $t = 0$ to $t = 2$.

I Probability and Statistics sheet: Day 5
V The number of subsets in set A is 24 more than set B. How many elements in set A?
E 1. Take easy test on s or x, v, and a. 2. Learn Newton's Method of approximating roots of a equation.
S None

F #102 Free Response Problem: A particle moves on the x-axis so that its position at any time $t = 0$ is given by $x(t) = 2te^{-t}$.
a) Find the acceleration of the particle at $t = 0$.
b) Find the velocity of the particle when its acceleration is zero.
c) Find the total distance traveled by the particle from $t = 0$ to $t = 5$.
and also do the following: p.266 (4,5)
and add the following problems: Find x_2 using Newton's method.

1. $f(x) = x^3 + 2x - 5$ on [1,2] Let $x_0 = 1$ 2. $f(x) = 2\cos x - x^2$ Let $x_0 = 1$

3. $f(x) = 2\cos x - x^2$ Let $x_0 = -1$

I Probability and Statistics sheet: Day 6
V Find a root of $f(x) = \cos x - x$ using Newton's method.
E 1. Learn Newton's Method of approximating roots of a equation. (You will need your calculator!)
S 1. $f(x) = x^3 - 3x + 1$. Approximate the root using Newton's method. Use your graphing calculator to verify your answer. 2. Approximate the root of $f(x) = x^3 - x - 1$ using Newton's method and verify your answer using your graphing calculator.

AP CALCULUS FIVES

F #103 Worksheet #50

I Probability and Statistics sheet: Day 7

V Find the rate of change of $y = \sqrt{x^2 + 16}$ with respect to $t = \frac{x}{x-1}$ when $x = 3$.

E 1. Using Newton's Method to approximate the zeros of roots of $f(x)$.
2. You will need your calculator.
3. Could there be another surprise on the horizon?

S $f(x) = x^2 - 2$ Find positive and negative roots to 3 decimal places.

F #104 Free Response Problem:

Consider the curve $y^2 = 4 + x$ and the chord AB joining points A(–4,0) and B(0,2) on the curve.

a) Find the x and y coordinate of the point on the curve where the tangent line is parallel to the chord AB.
b) Find the area of the region R enclosed by the curve and the chord AB.
c) Find the volume of the solid generated when the region R, defined in part (b), is revolved about the x-axis.

and also, Read pages 248–257 and do the following:

For problems 1 – 2: Find a) a or good x b) dx c) $dy = f\,'(a)dx$
d) approximation of $f(x) = f(a) + dy$ e) actual f(x) - use calculator

1. $f(x) = x^2 + 2x$ approximate f(.1)
2. $f(x) = x - 1$ approximate f(.01)
3. Approximate using differentials (as above): $(7.8)^{4/3}$

In problems 4 – 7, use Newton's method then check your answer by graphing the function on your graphing calculator and calculating the root.

4. Use Newton's method to find the fifth root of 23.
5. Find the first point of intersection of the curves $f(x) = \sin x$ and $g(x) = e^{-x}$.
6. Use Newton's method to find the positive fourth root of 2 by solving the equation $x^4 - 2 = 0$. Start with $x_1 = 1$.

I Probability and Statistics sheet: Day 8

V Find the x-coordinate of all points of intersection of the curves $y = x^2$ and $y = \sqrt{2x + 1}$.
Show work for Newton's method.

E 1. To approximate the value of a function using differentials.
2. More work approximating roots using Newton's method.
3. Are you prepared for ANYTHING!!!!!

S Approximation formulae: $dy \approx f\,'(a)\,dx$ or $dy \approx \frac{dy}{dx}\,dx$ where x changes from " a " to " a + dx ".

F #105 Worksheet #51

I Probability and Statistics sheet: Day 9

V What is the average value of $f(x) = 3\sin^2 x - \cos^2 x$ over $\left[0, \frac{p}{2}\right]$?

A) 0 B) 1 C) $\sqrt{2}$ D) $\sqrt{3}$ E) $\frac{p}{2}$

E 1. Discuss differentials. 2. Learn to approximate a function using a tangent line (linearization).

S Are you ready for anything? Be prepared! Stay focused!

AP CALCULUS FIVES

F #106

Free Response Problem: Given that f is the function defined by $f(x) = \dfrac{x^3 - x}{x^3 - 4x}$

a) Find $\lim_{h \to 0} f(x)$

b) Find the zeros of f.

c) Write an equation for each verical and horizontal asymptote to the graph of f.

d) Describe the symmetry of the graph of f.

and also do the following problems:

1. Find a) a or good x b) dx c) dy = f ' (a)dx d) approximation of f(x) = f(a) + dy
   e) actual f(x) - use calculator: $f(x) = 2x^2 + 4x - 3$. Approximate f(–.9).
2. Approximate using differentials: $\sqrt{4.5}$
3. Approximate using differentials: $(2.1)^{-1}$
4. Find formula for the approximate change in volume of sphere when radius changed by amount dr.
5. Find formula for the approximate change in the volume of a cube when the edge lengths change by an amount dx.
6. The edge of a cube is measured as 10 cm with a possible error of 1%. The cube's volume is to be calculated from this measurement. Find the volume and the error in this calculation.
7. Find the root of $y = x^5 - 2$ using Newton's approximation.

I Probability and Statistics sheet: Day 10

V How many more diagonals in an octagon than in a hexagon?

E 1. Discuss differentials. 2. Learn to approximate a function using linear approximations.

S 1. The diameter of a sphere is measured as 100 ± 1 cm and the volume is calculated from this measurement. Estimate the percentage error in this calculation.

F #107 Worksheet #52

I 1. If $f(x) = \dfrac{1}{x^2 + 1}$ and $g(x) = \sqrt{x}$, then the derivative of $f(g(x))$ is

A) $\dfrac{-\sqrt{x}}{(x^2 + 1)^2}$ B) $-(x + 1)^{-2}$ C) $\dfrac{-2x}{(x^2 + 1)^2}$ D) $\dfrac{1}{(x + 1)^2}$ E) $\dfrac{1}{2\sqrt{x}\,(x + 1)}$

2. $\lim_{x \to 2} \dfrac{\sqrt{x^2 - 2} - \sqrt{-x + 4}}{x - 2} =$

V Find the area enclosed between the graphs of $x + 2 = y^2$ and $y = x$.

E 1. Continue to work on approximations.

S Some "notes" problems.

F #108 Worksheet #53

I 1. The average value of sin 2x on the interval $0 < x < \dfrac{p}{2}$ is

2. Let $f(x) = \sin^2 x \cos^2 2x$. Find $\int_0^2 f(x)\,dx$.

A) 0.715 B) 1.211 C) 3.121 D) 0.015 E) 4.782

V If $\int f(x)\,dx = g'(x)$ and $g(x) = f'(x)$, then $\int x f(x)\,dx$ is equal to _____?

E 1. Continue to work on approximations.
2. Prepare for upcoming test.

AP CALCULUS FIVES

S More Notes problems.

F #109 Worksheet #54 **Test tomorrow!!**

I 1. Let (–2,g(–2)) be a relative maximum for $g(x) = 2x^3 + hx^2 + kx - 6$. Use the fact that $\left(\frac{-1}{2}, g\left(\frac{-1}{2}\right)\right)$ is an inflection point to find the value of (h – k).

A) 9 B) –9 C) 15 D) –15 E) 24

2. The average value of the function $f(x) = e^{-x^2}$ on the closed interval [–1,1] is

A) 0.37 B) 0.75 C) 1.00 D) 1.49 E) 1.81

V The function f given by $f(x) = 3x^5 - 4x^3 - 3x$ is increasing and concave up over which of these intervals?

A) $\left(-8, -\sqrt{\frac{2}{5}}\right)$ B) $\left(-\sqrt{\frac{2}{5}}, 0\right)$ C) (–1,1) D) $\left(\sqrt{\frac{2}{5}}, 8\right)$ E) (1,8)

E 1. Continue to work on approximations. 2. Prepare for tomorrow's test that will primarily cover approximations using Newton's method and using differentials (linear approximations).

S Plenty of "notes" problems.

F #110 **TEST TODAY !!**

1. If $f(x) = x^3 - 2x - 1$, then $f(-2) =$ A) –17 B) –13 C) –5 D) –1 E) 3
2. The domain of $f(x) = \frac{x-1}{x^2+1}$ is

A) all $x \neq 1$ B) all $x \neq 1, -1$ C) all $\neq -1$ D) $x = 1$ E) all reals

3. The domain of $g(x) = \frac{\sqrt{x-2}}{x^2 - x}$ is

A) all $x \neq 0, 1$ B) $x = 2, x \neq 0, 1$ C) $x = 2$ D) $x = 2$ E) $x > 2$

4. If $f(x) = x^3 - 3x^2 - 2x + 5$ and $g(x) = 2$, then $g(f(x)) =$

A) $2x^3 - 6x^2 - 2x + 10$ B) $2x^2 - 6x + 1$ C) –6 D) –3 E) 2

5. With the functions and choices as in question 4, which choice is correct for $f(g(x))$?

I 1. $\int_0^{p/2} \cos^2 x \sin x\,dx =$ A) – 1 B) $-\frac{1}{3}$ C) 0 D) $\frac{1}{3}$ E) 1

2. The acceleration of a particle moving along a straight line is given by a = 6t. If, when t = 0, its velocity, v, is 1 and its distance, s, is 3, then at any time t

A) $s = t^3 + 3$ B) $s = t^3 + 3t + 1$ C) $s = t^3 + t + 3$

D) $s = \frac{t^3}{3} + t + 3$ E) $s = \frac{t^3}{3} + \frac{t^2}{2} + 3$

V If $y = \frac{1}{\sin\left(t + \sqrt{t}\right)}$, then y ' (1) is

A) –0.002 B) –1,641.070 C) .755 D) 410.267 E) –0.070

E 1. Take easy test on approximations. 2. Practice working with functions.

S None

AP CALCULUS FIVES

F #111

1. Make a trig chart from – p to p — written out to be graded **on a separate piece of paper from the rest of the homework and find the following using your trig chart (NOT YOUR CALCULATOR):**

2. $\sin\left(\frac{5p}{4}\right)$ 3. $\cos\left(\frac{11p}{6}\right)$ 4. $\tan\left(\frac{4p}{3}\right)$

5. $\csc\left(\frac{7p}{6}\right)$ 6. $\sec\left(\frac{5p}{6}\right)$ 7. $\cot\left(\frac{23p}{6}\right)$

8. $\sin^{-1}\left(-\frac{1}{2}\right)$ 9. $\cos^{-1}\left(-\frac{1}{2}\right)$ 10. $\tan\left(-\frac{3p}{2}\right)$

11. If $\sin x = \frac{3}{5}$, find $\sin(2x)$. $\left(\frac{p}{2} < x < p\right)$

12. If $\sin x = \frac{3}{5}$, find $\cos(2x)$.

I 1. If $y = f(x^2)$ and $f'(x) = \sqrt{5x-1}$, then $\frac{dy}{dx}$ is equal to

A) $2x\sqrt{5x^2-1}$ B) $\sqrt{5x-1}$ C) $2x\sqrt{5x-1}$ D) $\frac{\sqrt{5x-1}}{2x}$ E) none of these

2. The point(s) on the curve $x^2 - y^2 = 4$ closest to the point (6,0) is (are)

A) (2,0) B) $(\sqrt{5}, \pm 1)$ C) $(3, \pm\sqrt{5})$ D) $(\sqrt{13}, \pm\sqrt{3})$ E) none of these

V None

E 1. To construct the trig table.

S Find sin x, cos x, tan x for $-p \le x \le p$

AP CALCULUS FIVES

F #112

1. If $\frac{dN}{dt} = \frac{1}{5}$ N, and N(0) = 500, then N(t) =

A) $\frac{N^2}{10}$ + 500 B) 500 e^{-5kt} where k is a constant C) 500 $e^{t/5}$ D) 500 $e^{-kt/5}$ E) None

2. The rate of increase of a population is given by $\frac{dN}{dt} = \frac{1}{2}$ N. If the initial population is 1000, then find the equation that will give the population at any time t.

3. The rate of mass decay for a certain radioactive substance is given by $\frac{dM}{dt} = -\frac{M}{50}$, where M is in grams and t is in years. If the initial mass of the substance is 250 grams, what mass will remain when t = 100ln 2 years? A) 125 g B) 2.5 g C) 62.5 g D) 2.5ln 2 g E) $\frac{250}{e^2}$ g

The table shown is for Questions 4 and 5. The differentiable functions f and g have the values shown.

x	f	f'	g	g '
1	2	1/2	–3	5
2	3	1	0	4
3	4	2	2	3
4	6	4	3	1/2

4. The average rate of change of function f on [1,4] is
A) $\frac{7}{6}$ B) $\frac{4}{3}$ C) $\frac{15}{8}$ D) $\frac{9}{4}$ E) $\frac{8}{3}$

5. If h(x) = g(f(x)) then h ' (3) = A) $\frac{1}{2}$ B) 1 C) 4 D) 6 E) 9

I 1. Find dy if cos(x) = y^2

2. Construct a trig chart for sin, cos, tan from $-\frac{p}{2}$ to $\frac{p}{2}$.

V Find the function y which has its reciprocal as its derivative.

E 1. A first look at growth and decay problems! 2. Soon, class, very soon!

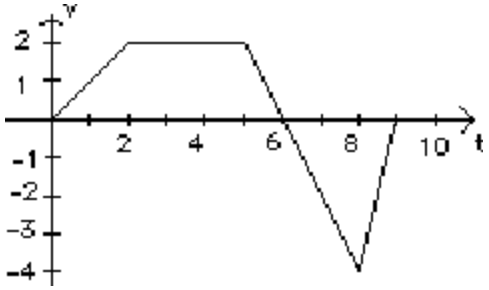
S 1. A colony of bacteria is grown in a lab such that the number of bacteria grows proportional to the number present. Initially there are 1250 bacteria. At the end of 3 hours there are 10,000 bacteria. How many are there after 5 hours? 2. In a certain culture of bacteria, the rate of growth is proportional to the amount present. If 1,000 bacteria are present initially and 2,000 are present in 12 minutes, how many minutes (to one decimal place) have passes when 1,000,000 bacteria are present?

AP CALCULUS FIVES

F #113

1. A population grows exponentially according to the formula $N(t) = 200\,e^{kt}$ where k is the growth constant. If N = 12,800 when t = ln 8, then find k.
   A) ln 2 B) 2 C) 64 D) ln 64 E) 4
2. The rate of growth of a certain population equals one tenth of the present population. If the initial population is 5000, what will the population be in 20 years?
3. The rate of decay of the mass of a certain radioactive isotope is given by $\frac{dM}{dt} = -\frac{1}{20}M$ where M is measured in grams and time t is measured in years. If the initial mass present was 40 grams, what mass will remain after 60 years?
4. The x-coordinate of the absolute maximum of $f(x) = 3x^3 - \frac{9}{2}x^2$ on [–2,2] is:

   A) 0 B) 2 C) 1 D) –2 E) $\frac{1}{2}$



For Questions 5, 6, and 7, the graph shows the velocity of an object moving along a line, for $0 \le t \le 9$.

5. At what time does the object attain its maximum acceleration?
   A) $2 < t < 5$ B) $5 < t < 8$ C) $t = 6$ D) $t = 8$ E) $8 < t < 9$
6. The object is farthest from the starting point at t = A) 2 B) 5 C) 6 D) 8 E) 9
7. At t = 8, the object was at position x = 10. At t = 5, the position was x =
   A) –5 B) 5 C) 7 D) 13 E) 15

I 1. If the initial approximation of a root of $x^3 - 15 = 0$ is given as $x_0 = 3$, then the next approximation produced by Newton's method would be:
   A) $\frac{3}{4}$ B) $\frac{23}{9}$ C) $\frac{22}{9}$ D) $\frac{23}{11}$ E) $\frac{24}{11}$
2. Construct a trig chart for sin, cos, tan from 0 to p .

V Find the point on the graph of $y = -4x + 3$ nearest the origin. (Show all work.)
A) $\left(\frac{3}{5}, \frac{3}{5}\right)$ B) $\left(\frac{12}{17}, \frac{3}{17}\right)$ C) (0,3) D) $\left(\frac{3}{4}, 0\right)$ E) $\left(\frac{1}{2}, 1\right)$

E 1. Continue to work on growth problems.

S In a certain culture of bacteria the rate of growth of the bacteria is proportional to the amount present. If 1,000 bacteria were present initially and it doubles in 3 minutes, how many would be present in 12 minutes?

AP CALCULUS FIVES

F #114

1. A differentiable function has values shown in this table:

X	2.0	2.2	2.4	2.6	2.8	3.0
f (x)	1.39	1.73	2.10	2.48	2.88	3.30

Estimate $f'(2.1)$.

A) 0.34 B) 0.59 C) 1.56 D) 1.70 E) 1.91

2. An object moving along a line has velocity v (t) = t cos t – ln (t + 2), where 0 = t = 10. The object achieves its maximum speed when t =

A) 3.743 B) 5.107 C) 6.419 D) 7.550 E) 9.538

AND THE FOLLOWING:

1989 AB Free Response (6) Oil is being pumped continuously from a certain well at a rate proportional to the amount of oil left in the well; that is, $\frac{dy}{dt} = ky$, where y is the amount of oil left in the well at any time t. Initially there were 1,000,000 gallons of oil in the well, and 6 years later there were 500,000 gallons remaining. It will no longer be profitable to pump oil when there are fewer than 50,000 gallons remaining.

(a) Write an equation for y, the amount of oil remaining in the well at any time t.

(b) At what rate is the amount of oil in the well decreasing when there are 600,000 gallons of oil remaining?

(c) In order not to lose money, at what time t should oil no longer be pumped from the well?

I 1. If $f(x) = \frac{1}{x^2 + 1}$ and $g(x) = \sqrt{x}$, then the derivative of $f(g(x))$ is

A) $\frac{-\sqrt{x}}{(x^2 + 1)^2}$ B) $-(x + 1)^{-2}$ C) $\frac{-2x}{(x^2 + 1)^2}$ D) $\frac{1}{(x + 1)^2}$ E) $\frac{1}{2\sqrt{x}\,(x + 1)}$

2. Construct a trig chart for sin, cos, tan from $-\frac{p}{2}$ to $\frac{p}{2}$.

V Determine the value of a + b so that the function $G(x) = \begin{cases} -3ax^2 - 1 & \text{if } x > 1 \\ 3b - 2x & \text{if } x = 1 \end{cases}$

is continuous at x = 1. A) $\frac{1}{3}$ B) 1 C) $-\frac{1}{3}$ D) – 1 E) 0

E 1. Continue to work on growth problems. 2. Prepare for who-knows-what?

S If $\frac{dQ}{dt} = 2Q$ and $Q = e^2$ when t = 4, then find Q when t = 2

AP CALCULUS FIVES

F #115

1. If $f(t) = \int_0^{t^2} \frac{1}{1+x^2}\,dx$, then $f'(t)$ equals

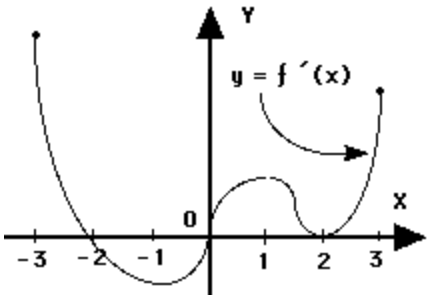
   A) $\frac{1}{1+t^2}$ B) $\frac{2t}{1+t^2}$ C) $\frac{1}{1+t^4}$ D) $\frac{2t}{1+t^4}$ E) $\tan^{-1} t^2$

2. The rate at which a purification process can remove contaminants from a tank of water is proportional to the amount of contaminant remaining. If 20% of the contaminant can be removed during the first minute of the process and 98% must be removed to make the water safe, approximately how long will the decontamination process take?

   A) 2 min B) 5 min C) 18 min D) 20 min E) 40 min

AND THE FOLLOWING:

1985 AB Essay (6) The figure below shows the graph of f ', the derivative of a function f. The domain of the function f is the set of all x such that $-3 \le x \le 3$.



Note: This is the graph of the derivative of f, not the graph of f.

(a) For what values of x, $-3 < x < 3$, does f have a relative maximum? A relative minimum? Justify your answer.

(b) For what values of x is the graph of f concave up? Justify your answer.

(c) Use the information found in parts (a) and (b) and the fact that $f(-3) = 0$ to sketch a possible graph of f on the axes provided below.

I 1. The maximum value of the function $f(x) = x^4 - 4x^3 + 6$ on the interval [1,4] is

(A) 1 (B) 0 (C) 3 (D) 6 (E) none of these

2. Construct a trig chart for sin, cos, tan from – p to p.

V The area of the largest isosceles triangle that can be drawn with one vertex at the origin and with the others on a line parallel to and above the x-axis and on the curve $y = 27 - x^2$ is

(A) 108 (B) 27 (C) $12\sqrt{3}$ (D) 54 (E) $24\sqrt{3}$

E 1. You are special! You have distinguished yourself!! Show that off this week!!! We're getting down to business now!!! 2. Be ready for anything!

S Look at the graphs of functions and their derivatives on the calculator.

F #116

Free Response 1991 (1)

1. Let f be the function that is defined for all real numbers x and that has the following properties
   (i) $f\,''(x) = 24x - 18$
   (ii) $f\,'(1) = -6$
   (iii) $f(2) = 0$
   (a) Find each x such that the line tangent to the graph of f at $(x, f(x))$ is horizontal.
   (b) Write an expression for $f(x)$.
   (c) Find the average value of f on the interval $1 \le x \le 3$.

AND THE FOLLOWING:

1. A puppy weighs 2.0 pounds at birth and 3.5 pounds two months later. If the weight of the puppy during its first 6 months is increasing at a rate proportional to its weight, then how much will the puppy weigh when it is 3 months old?
   (A) 4.2 lbs (B) 4.6 lbs (C) 4.8 lbs (D) 5.6 lbs (E) 6.5 lbs
2. The population of a county increases at a rate proportional to the existing population. If the population doubles in 20 years, then the factor (constant) of proportionality, k, is
   (A) $\ln 2$ (B) $\ln 20$ (C) $\frac{1}{20}\ln 2$ (D) $\frac{1}{2}\ln 20$ (E) $2e^{-20}$
3. The rate of increase of a population, $\frac{dN}{dt}$, is given by $\frac{dN}{dt} = \frac{1}{2}N$. If the initial population is 1000, which of the following equations will give the population at any time t?
   (A) $N = e^{t/2}$ (B) $N = e^{500t}$ (C) $N = 1000\,e^{kt/2}$ (D) $N = 1000\,e^{t/2}$ E) $N = 1000\,e^{-t/2}$
4. $\lim\limits_{h\to 0} \dfrac{\ln(2+h) - \ln 2}{h}$ is A) 0 B) $\ln 2$ C) $\frac{1}{2}$ D) $\frac{1}{\ln 2}$ E) 8
5. At how many points of the interval $[0, p]$ does $f(x) = 2\sin x + \sin 4x$ satisfy the Mean Value Theorem? A) none B) 1 C) 2 D) 3 E) 4

I 1. $\int_{-1}^{1}(x^2 - x - 1)dx =$ A) $\frac{2}{3}$ B) 0 C) $-\frac{4}{3}$ D) –2 E) –1

2. $\frac{d}{dt}\int_{0}^{t}\sqrt{x^3 + 1}\,dx =$

A) $\sqrt{t^3 + 1}$ B) $\dfrac{\sqrt{t^3 + 1}}{3t^2}$ C) $\frac{2}{3}(t^3 + 1)(\sqrt{t^3 + 1} - 1)$ D) $3x^2\sqrt{x^3 + 1}$ E) none of these

V $\lim\limits_{x\to 0} x\sin\dfrac{1}{x}$ is

E 1. Hip–Hop to a 5! 2. Review growth and decay problems and free-response questions.

S Practice makes you better!!!!

AP CALCULUS FIVES

F #117 **1991 Free Response(2) and 1991 Free Response (3,4)**

2. Let R be the region between the graphs of $y = 1 + \sin(\pi x)$ and $y = x^2$ from $x = 0$ to $x = 1$.
   (a) Find the area of R.
   (b) Set up, but do not integrate an integral expression in terms of a single variable for the volume of the solid generated when R is revolved about the x – axis.
   (c) Set up, but do not integrate an integral expression in terms of a single variable for the volume of the solid generated when R is revolved about the y – axis.

3. Let f be the function defined by $f(x) = (1 + \tan x)^{3/2}$ for $-\frac{\pi}{4} < x < \frac{\pi}{2}$.
   (a) Write an equation for the line tangent to the graph of f at the point where $x = 0$.
   (b) Using the equation found in part (a), approximate $f(0.02)$.
   (c) Let f^{-1} denote the inverse function of f. Write an expression that gives $f^{-1}(x)$ for all x in the domain of f^{-1}.

4. Let f be the function given by $f(x) = \frac{|x| - 2}{x - 2}$.
   (a) Find all the zeros of f.
   (b) Find $f'(1)$.
   (c) Find $f'(-1)$.
   (d) Find the range of f.

I 1. A smooth curve with equation $y = f(x)$ is such that its slope at each x equals x^2. If the curve goes through the point (–1, 2), then its equation is

A) $y = \frac{x^3}{3} + 7$ B) $x^3 - 3y + 7 = 0$ C) $y = x^3 + 3$ D) $y - 3x^3 - 5 = 0$ E) none

2. The value of k for which the line $3x + ky - 5 = 0$ is perpendicular to the line $x - 2y + 7 = 0$ is A) $\frac{3}{2}$ B) $-\frac{3}{2}$ C) 6 D) -6 E) $\frac{2}{3}$

V The curve $x^3 + x \tan y = 27$ passes through (3,0). Use local linearization to estimate the value of y at $x = 3.1$. The value is: A) –2.7 B) –0.9 C) 0 D) 0.1 E) 3.0

E 5–Gotta Have it! 2. Be getting ready for the change.

S If $f(x) = \begin{cases} x^2 & \text{for } x = 2 \\ 4x - x^2 & \text{for } x > 2 \end{cases}$ then $\int_{-1}^{4} f(x)\,dx$ equals

A) 7 B) $\frac{23}{3}$ C) $\frac{25}{3}$ D) 9 E) $\frac{65}{3}$

AP CALCULUS FIVES

F #118 Worksheet #55

I 1. $\int_1^2 \sqrt{5x}\,dx$ = A) 2.726 B) 2.981 C) 3.354 D) 13.628 E) 20.442

2. If $f(x) = \sqrt[5]{x^3 - 2x}$, then $f'(\sqrt{3})$ = A) 0.129 B) 0.902 C) 0.906 D) 1.116 E) 2.173

V $\int_{\pi/6}^{\pi/2} \cot x\,dx$ = A) $\ln \frac{1}{2}$ B) $\ln 2$ C) $-\ln(2 - \sqrt{3})$ D) $\ln(\sqrt{3} - 1)$ E) none of these

E 1. Approximating the area under a curve using rectangles. 2. Finding the exact area under a curve by integrating. 3. Finding the area between two curves. 4. More practice with free-response questions. 5. **WHAT WILL YOU SAY: YES , NO , OR ARE YOU STILL A MAYBE ??**

S **5**–Gotta Have it!

F #119 Worksheet #56

I 1. The graph of $y = e^{x/2}$ is reflected in the line $y = x$. An equation of the reflection is $y =$

A) $2 \ln x$ B) $\ln \frac{x}{2}$ C) e^{2x} D) $e^{-x/2}$ E) $\frac{1}{2} \ln x$

2. The average (mean) value of $y = \ln x$ over the interval from $x = 1$ to $x = e$ equals

A) $\frac{1}{2}$ B) $\frac{1}{2(e-1)}$ C) $\frac{2}{e-1}$ D) $\frac{1}{e-1}$ E) none of these

V The set of x for which $|x - 3| = 2$ and for which $|x| > 4$ is

A) $4 < x \le 5$ B) $-4 < x \le 1$ C) $x < -4$ or $x \ge 1$ D) $1 \le x < 3$ E) none of these

E 1. When we go over the homework, make sure that you understand all of your mistakes. It is important to know what you don't know so you can improve.

S 1. When do you turn your head sideways for finding area?
2. What is the domain of $y = \ln(\sin x)$?
EXAM TOMORROW - ARE YOU READY?

F #120 Worksheet #57

I 1. $\lim_{x \to \infty} \frac{20x^2 - 13x + 5}{5 - 4x^3}$ is A) –5 B) 8 C) 0 D) 5 E) 1

2. If $y = e^{-x^2}$, then $y''(0)$ equals A) 2 B) –2 C) $\frac{2}{e}$ D) 0 E) –4

V Let $f(x) = x^5 + 1$ and let g be the inverse function of f. What is the value of $g'(0)$?

A) –1 B) $\frac{1}{5}$ C) 1 D) $g'(0)$ does not exist.

E) It cannot be determined from the given information.

E When is a test NOT a surprise test? The answer is — when you are told that you have one!!!!! **Be ready for today's test!**

S Are you ready for today????

AP CALCULUS FIVES

F #121

NOTE: IF YOU HAVE POSITIVELY DECIDED TO BE IN THE <u>RAISE</u> GROUP (NOT TAKING THE AP TEST), THEN YOU WILL DO THE RAISE ASSIGNMENT TONIGHT, NOT THIS ONE!!

You will receive an actual Advanced Placement multiple choice test from the past and a scantron. Sometime during Spring Break, you should find a place where you can work uninterrupted for 105 minutes $\left[1\frac{3}{4} \text{ hours}\right]$ and then work the problems placing the answers on the scantron. You may use scratch paper. You will work 55 minutes on Section I, Part A without a calculator, and 50 minutes on Section I, Part B with your calculator. Do work on scratch paper or test sheets. **Do not copy problems**. Work as fast as you can. If you have extra time, then check your answers. When finished, put your heading on the test and the scratch paper and put your name and period on the scantron. **Sign integrity on the scantron.** This means you did not work extra time on the test nor receive help on it. It will not be counted as a test, but as a homework. Your test and scratch paper with your work on it will be your justification for receiving full points on this assignment.

You will also receive an actual Advanced Placement Free Response examination. Sometime during Spring Break, you need to find a quiet place where you will not be interrupted so you can work on this test for 90 minutes $\left[1\frac{1}{2} \text{ hours}\right]$. You will work 45 minutes on Section II, Part A with a calculator, and 45 minutes on Section II, Part B without your calculator. Use sheets of blank notebook paper to put your **work and answers.** You should use at least one sheet of paper per problem. Do not copy the problems. Just number them so they can be followed. When finished with the test, put your heading on all the pages. **Sign integrity on the bottom of the last page.** This means you did not work extra time on the test nor receive help on it. It will not be counted as a test, but as a homework. These pages will be the justification for you to receive the full points on this assignment.

Bring both assignments {800 points} and the tests with you on the Monday after the break

I None

V In marathon, when the winner crosses the finish line many runners are still on the course, some quite far behind. If the density of runners x miles from the finish line is given by $R(x) = 20[1 - \cos(1 - .03x^2)]$ runners per mile, how many are within 8 miles of the finish line?

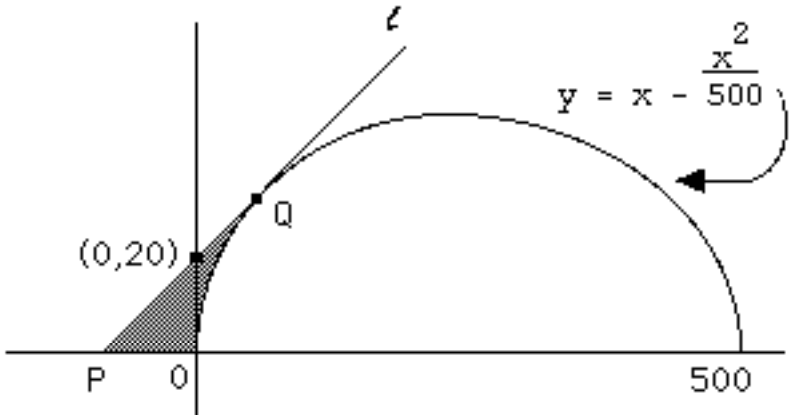
A) 30 B) 145 C) 157 D) 166 E) 195

E
1. Have a great spring break.
2. Work hard and quickly on assignments. This will give a picture of where you are in pursuit of a **5**.
3. See you Monday. Be ready for ANYTHING when you get back!!!!

S Have a great **5** days of vacation and say hello to the big bunny!

AP CALCULUS FIVES

SOME EXTRA STUFF TO DO THIS WEEK IF YOU NEED IT!!! 1996 Free Response (6)



Line l is tangent to the graph of $y = x - \frac{x^2}{500}$ at point Q, as shown in the figure above.

(a) Find the x-coordinate of point Q. (b) Write an equation for line l.

(c) Suppose the graph of $y = x - \frac{x^2}{500}$ shown in the figure, where x and y are measured in feet, represents a hill. There is a 50-foot tree growing vertically at the top of the hill. Does a spotlight at point P directed along line l shine on any part of the tree? Show the work that leads to your conclusion. **AND**

1. A solution of the differential equation $y\,dy = x\,dx$ is
   A) $x^2 - y^2 = 4$ B) $x^2 + y^2 = 4$ C) $y^2 = 4x^2$ D) $x^2 - 4y^2 = 0$ E) $x^2 = 9 - y^2$
2. If $\frac{dy}{dx} = \frac{x}{\sqrt{9+x^2}}$ and $y = 5$ when $x = 4$, then
   A) $y = \sqrt{9+x^2} - 5$ B) $y = \sqrt{9+x^2}$ C) $y = 2\sqrt{9+x^2} - 5$ D) $y = \frac{\sqrt{9+x^2}+5}{x}$ E) none

In questions 3 and 4: The position of a particle moving along a straight line is given by $s = t^3 - 6t^2 + 12t - 8$.

3. The distance s is increasing for A) $t < 2$ B) all t except $t=2$ C) $1<t<3$ D) $t<1$ or $t>3$ E) $t>2$
4. The velocity is decreasing for A) $t>2$ B) $t<3$ C) all t D) $t<1$ or $t>2$ E) none of these
5. If $f(t) = \frac{1}{t^2} - 4$ and $g(t) = \cos t$, then the derivative of $f(g(t))$ is
   A) $2\sec^2 t \tan t$ B) $\tan t$ C) $2 \sec t \tan t$ D) $\frac{2}{t^3 \sin t}$ E) $-\frac{2}{\cos^3 t}$
6. The volume obtained by rotating the region bounded by $x = y^2$ and $x = 2 - y^2$ about the y-axis is
   A) $\frac{16p}{3}$ B) $\frac{32p}{3}$ C) $\frac{32p}{15}$ D) $\frac{64p}{15}$ E) $\frac{8p}{3}$
7. If the lines $ax + by = 3$ and $a'x + b'y = 4$ are perpendicular, then it follows that
   A) $\frac{a}{b'} = \frac{b}{a'}$ B) $ab' = a'b$ C) $aa' = -bb'$ D) $\frac{a}{a'} = \frac{b}{b'}$ E) none of these is true

8. A cup of coffee at temperature 180°F is placed on a table in a room at 68°F. The differential equation (d.e.) for its temperature at time t is $\frac{dy}{dt} = -0.11(y - 68)$; $y(0) = 180$.

After 10 minutes the temperature (in °F) of the coffee is (calculator)
A) 96 B) 100 C) 105 D) 110 E) 115

9. Let f be the function given by $f(x) = \frac{x^4}{16} - x^3 + \frac{3x^2}{8} - 2x$.

The function f has a relative minimum at x= (A) 0.00 (B) 8.00 (C) 11.80

F #122 Worksheet #58

I 1. The number of vertical tangents to the graph of $y^2 = x - x^3$ is

A) 4 B) 3 C) 2 D) 1 E) 0

2. $\int_0^6 f\,(x-1)\,dx =$

A) $\int_1^7 f(x)dx$ B) $\int_{-1}^{5} f\,(x)\,dx$ C) $\int_{-1}^{5} f\,(x+1)\,dx$ D) $\int_{1}^{5} f\,(x)\,dx$ E) $\int_{1}^{7} f\,(x)\,dx$

V The table shows the speed of an object in feet per second during a three-second period. Estimate the distance the object travels, using the trapezoid method:

A) 34 ft B) 45 ft C) 48 ft D) 49 ft E) 64 ft

E Decision Day is almost here --

S Have you decided yet ?!?

F #123 Worksheet #59

I 1. What is $\lim_{x\to 0} \frac{\cos\left(\frac{p}{2}+h\right)-\cos\left(\frac{p}{2}\right)}{h}$ = ? A) -1 B) $-\frac{\sqrt{2}}{2}$ C) 0 D) 1 E) does not exist

2. What is $\lim_{x\to\infty} \frac{x^2-4}{2+x-4x^2}$? A) -2 B) $-\frac{1}{4}$ C) $\frac{1}{2}$ D) 1 E) doesn't exist

V Two particles start at the origin and move along the x-axis. For $0 = t = 10$, their respective position functions are given by $x_1 = \sin t$ and $x_2 = e^{-2t} - 1$. For how many values of t do the particles have the same velocity? A) none B) one C) two D) three E) four

E Decision Day is rapidly approaching!!

S 5 – Gotta have it !!

AP CALCULUS FIVES

F #124 Worksheet #60

I 1. The average value of the function $f(x) = e^{-x^2}$ on the closed interval [–1, 1] is
A) 0.70 B) 0.75 C) 0.80 D) 0.85 E) 0.90

2. The volume generated by revolving about the x–axis the region enclosed by the graphs of $y = 2x$ and $y = 2x^2$, for $0 = x = 1$, is

A) $p\int_0^1 (2x - 2x^2)^2\,dx$ B) $p\int_0^1 (4x^2 - 4x^4)\,dx$ C) $2p\int_0^1 x(2x - 2x^2)\,dx$

D) $p\int_0^2 \left(\sqrt{\frac{y}{2}} - \frac{y}{2}\right)^2 dy$ E) $p\int_0^2 \left(\frac{y}{2} - \frac{y^2}{2}\right) dy$

V If f is continuous for all x, which of the following integrals necessarily have the same value?

I. $\int_a^b f(x)\,dx$ II. $\int_0^{b-a} f(x + a)\,dx$ III. $\int_{a+c}^{b+c} f(x + c)\,dx$

A) I and II only B) I and III only C) II and III only D) I, II, and III E) No two necessarily have the same value.

E Just do it! Be ready for the upcoming test.

S If the line $3x - 4y = 0$ is tangent in the first quadrant to the curve $y = x^3 + k$, then k is
A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) 0 D) $-\frac{1}{8}$ E) $-\frac{1}{2}$

NOTE: IF YOU HAVE DECIDED TO BE IN THE RAISE GROUP (NOT TAKING THE AP TEST), THEN YOU WILL DO THE RAISE ASSIGNMENT TONIGHT, NOT THIS ONE!!

F #125 Worksheet #61

I 1. Find the slope of the line tangent to the graph of $f(x) = 4x \ln x$ at the point where $x = 2.1$.
A) 4.93 B) 5.07 C) 6.23 D) 6.97 E) 7.27

2. If $\frac{dy}{dt} = p\,y$, which of the following could represent y?

A) $\frac{1}{p}e^t$ B) $y = p\,e^{x/t}$ C) $e^{p\,t} + p$ D) $p\,e^t$ E) $p\,e^{p\,t}$

V $\lim_{h\to 0} \frac{\sin(1+h) - \sin 1}{h} =$ A) 0 B) 0.54 C) 0.63 D) 0.89 E) none of these

E 1. Review average (mean) value of a function with trig functions — **5**–Gotta Have IT!! **5** is as easy as p to obtain!

S The derivative of $f(x) = \frac{x^4}{3} - \frac{x^5}{5}$ attains its maximum value at x = A) –1 B) 0 C) 1 D) $\frac{4}{3}$ E) $\frac{5}{3}$

AP CALCULUS FIVES

NOTE: IF YOU HAVE DECIDED TO BE IN THE RAISE GROUP (NOT TAKING THE AP TEST), THEN YOU WILL DO THE RAISE ASSIGNMENT TONIGHT, NOT THIS ONE!!

F #126 Worksheet #62 **DECISION DAY IS TODAY !!!**

I 1. The equation of the tangent to the curve $2x^2 - y^4 = 1$ at the point (–1,1) is
A) $y = -x$ B) $y = 2 - x$ C) $4y + 5x + 1 = 0$ D) $x - 2y + 3 = 0$ E) $x - 4y + 5 = 0$

2. If $f(x) = 2 \ln x$ and $g(x) = e^{x/2}$, then $f(g(x))$ =

A) x B) e^x C) 1 D) 2 E) none of these

V What is the area of the region completely bounded by the curve $y = -x^2 + x + 6$ and the line y =4? A) $\frac{3}{2}$ B) $\frac{7}{3}$ C) $\frac{9}{2}$ D) $\frac{31}{6}$ E) $\frac{33}{2}$

E There is a free response test TODAY.

S If you are NOT taking the AP Test, you do NOT have to take the test. Your test will be next week

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F #127 Worksheet #63

I 1. Which of the following is an equation for a line tangent to the graph of f(x)?
A) $y = 10x - 8.05$ B) $y = x - 8.05$ C) $y = x - 3.05$ D) $y = 10x - 11.5$ E) $y = 10x - 3.05$

2. The function f whose derivative is given by $f'(x) = 5x^3 - 15x + 7$ has a local maximum at x =
A) – 1.930 B) –1.000 C) 0.511 D) 1.000 E) 1.419

V Car A is traveling south at 40 mph toward Millville, and Car B is traveling west at 30 mph toward Millville at the same time. If both cars began traveling 100 miles outside of Millville at the same time, then at what rate, in mph, is the distance between them decreasing after 90 minutes?
A) 35.00 B) 47.79 C) 50.00 D) 55.14 E) 68.01

E 5 – Just Do It!!

S

F #128 Worksheet #64

I 1. If $y = 3x - 7$ and $x = 0$, what is the minimum product of x^2y ?
A) –5.646 B) 0 C) 1.555 D) 2.813 E) 3.841

2. What is the area of the region bounded by $y = \sin x$, $y = \left(\frac{1}{4}\right)^x - 1$, and the y-axis?

A) 0.772 B) 2.815 C) 3.926 D) 5.552 E) 34.882

V Let $f(x) = \frac{|x^2 - 1|}{x - 1}$. Which of these statements is true?

I. f is continuous at x = 1. II. f is differentiable at x = 1. III. f has a local maximum at x = –1.
A) I only B) II only C) III only D) I and III only E) II and III only

E Drive for 5!!

S

AP CALCULUS FIVES

F #129 Worksheet #65

I 1. If $y = \sqrt{\ln(x^2 + 1)}$ $(x > 0)$, then the derivative of y^2 with respect to $\ln x$ is

A) $\frac{2x}{x^2 + 1}$ B) $\frac{2}{x^2 + 1}$ C) $\frac{2x}{\ln x(x^2 + 1)}$ D) $\frac{2x^2}{x^2 + 1}$ E) none of these

2. Suppose $f(x) = \frac{x^2 + x}{x}$ if $x \neq 0$ and $f(0) = 1$. Which of the following statements are true of f?

I. f is defined at x = 0. II. $\lim_{x \to 0} f(x)$ exists. III. f is continuous at x = 0.

A) only I B) only II C) only I and II D) none of the statements is true E) all are true

V What is the area of the region completely bounded by the curve $y = -x^2 + x + 6$ and the line y =4?

A) $\frac{3}{2}$ B) $\frac{7}{3}$ C) $\frac{9}{2}$ D) $\frac{31}{6}$ E) $\frac{33}{2}$

E 1. Review area (approximating integrals) using rectangles and trapezoids.

S 1. If the Trapezoidal Rule is used with n = 5, then $\int_0^1 \frac{dx}{1 + x^2}$ is equal, to three decimal places, to

A) 0.784 B) 1.567 C) 1.959 D) 3.124 E) 7.837

2. The hypotenuse AB of a right triangle ABC is 5 ft, and one leg, AC, is decreasing at the rate of $2 \frac{\text{ft}}{\text{sec}}$. the rate, in square feet per second, at which the area is changing when AC = 3 is

A) $\frac{25}{4}$ B) $\frac{7}{4}$ C) $-\frac{3}{2}$ D) $-\frac{7}{4}$ E) $-\frac{7}{2}$

3. If c is the value defined by Rolle's theorem, then, for $f(x) = x \sin x$ on $[0, \pi]$, c =

A) 0 B) 1.571 C) 2.029 D) 3.124 E) none of these

F #130 Worksheet #66

I 1. $\int \cos^2 x\,dx$ 2. $\int \cos^3 x\,dx$ =

V $\lim_{x \to 0} \frac{|x|}{x}$ is A) 0 B) nonexistant C) 1 D) 2 E) none of these

E 1. Did you know that length of an average person's hand is exactly "**5**" inches? ***5 - Just Do It***

S 1. The equation of the tangent to the curve of $xy - x + y = 2$ at the point where x=0 is

A) $y = -x$ B) $y = \frac{1}{2}x + 2$ C) $y = x + 2$ D) $y = 2$ E) $y = 2 - x$

2. The equation of the tangent to the curve of $y = x^2 - 4x$ at the point where the curve crosses the y–axis is

A) $y = 8x - 4$ B) $y = -4x$ C) $y = -4$ D) $y = 4x$ E) $y = 4x - 8$

3. If $y = x^2 \ln x$ $(x>0)$, then y '' is equal to

A) $3 + \ln x$ B) $3 + 2\ln x$ C) $3\ln x$ D) $3 + 3\ln x$ E) $2 + x + \ln x$

4. The average value of the function e^{-x^2} on the closed interval $[-1,1]$ is

(A) 0.37 (B) 0.75 (C) 1.00 (D) 1.49 (E) 1.81

AP CALCULUS FIVES

F #131 Worksheet #67

I 1. If $f(x) = \frac{e^{\ln x}}{x}$, then f(1) is A) 0 B) 1 C) e D) $\frac{e}{2}$ E) not defined

2. The graph of $y = \frac{3x^2}{x^2 - 9}$ has

A) one horizontal and one vertical asymptote
B) two horizontal asymptotes, no vertical ones
C) two horizontal and one vertical asymptotes
D) one horizontal and two vertical asymptotes
E) two vertical asymptotes, no horizontal ones

V At how many points on the interval [–5,5] is a tangent to $y = x + \cos x$ parallel to the secant line?
(A) none (B) 1 (C) 2 (D) 3 (E) more than 3

E ***5-Just Do It!***

S 1. The region in the first quadrant enclosed by the y–axis and the graphs of y = cos x and y = x is rotated about the x–axis. The volume of the solid generated is
(A) 0.484 (B) 0.877 (C) 1.520 (D) 1.831 (E) 3.040

2. Find the volume of the solid generated when the region bounded by the y-axis, $y = e^x$, and y = 2 is rotated around the y-axis.
A) 0.296 B) 0.592 C) 2.427 D) 3.998 E) 27.577

F #132 Worksheet #68 **EASY EXAM TOMORROW!!**

I 1. If $f(x) = \frac{e^{\ln x}}{x}$, then f(1) is A) 0 B) 1 C) e D) $\frac{e}{2}$ E) not defined

2. The graph of $y = \frac{3x^2}{x^2 - 9}$ has

A) one horizontal and one vertical asymptote
B) two horizontal asymptotes, no vertical ones
C) two horizontal and one vertical asymptotes
D) one horizontal and two vertical asymptotes
E) two vertical asymptotes, no horizontal ones

V At how many points on the interval [–5,5] is a tangent to $y = x + \cos x$ parallel to the secant line?
(A) none (B) 1 (C) 2 (D) 3 (E) more than 3

E Review area and volume. ***5-Just Do It!***

S 1. The region in the first quadrant enclosed by the y–axis and the graphs of y = cos x and y = x is rotated about the x–axis. The volume of the solid generated is
(A) 0.484 (B) 0.877 (C) 1.520 (D) 1.831 (E) 3.040

2. Find the volume of the solid generated when the region bounded by the y-axis, $y = e^x$, and y = 2 is rotated around the y-axis. A) 0.296 B) 0.592 C) 2.427 D) 3.998 E) 27.577

AP CALCULUS FIVES

F #133 **EASY EXAM TODAY !!**

1997 Free Response (3 and 4) **AND** AP Practice Exam #4 in Barron's book mod4,res1 (4,8,12…)

I 1. The fundamental period of $2\cos(3x)$ is A) $\frac{2p}{3}$ B) $2p$ C) $6p$ D) 2 E) 3

2. The slope of the line normal to the graph of $y = 2\ln(\sec x)$ at $x = \frac{p}{4}$ is

A) -2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 2 E) nonexistent

V If $f(x) = 5^x$ and $5^{1.002} \approx 5.016$, which is closest to $f\,'(1)$?
(A) 0.016 (B) 1.0 (C) 5.0 (D) 8.0 (E) 32.0

E Be prepared. **AN EASY TEST TODAY IN PREPARATION FOR A 5!!**

S 1. You **MAY** use your graphing calculator on the Part B multiple choice problems and you **MUST NOT** use it on the Part A problems or the I problems.

F #134 1997 Free Response (5 and 6) **AND** AP Practice Exam #4 in Barron's book mod4,res1 (1,5,9…)

I 1. Let R be the region in the first quadrant enclosed by the graph of $y = (x+1)^{1/3}$, the line $x = 7$, the x-axis, and the y-axis. The volume of the solid generated when R is revolved about the y-axis is given by:

A) $p\int_0^7 (x+1)^{2/3}\,dx$ B) $2p\int_0^7 x(x+1)^{1/3}\,dx$ C) $p\int_0^2 (x+1)^{2/3}\,dx$

D) $2p\int_0^2 x(x+1)^{1/3}\,dx$ E) $p\int_0^7 (y^3-1)^2\,dy$

2. An antiderivative for $\frac{1}{x^2-2x+2}$ is

A) $-(x^2-2x+2)^{-2}$ B) $\ln(x^2-2x+2)$ C) $\ln\left|\frac{x-2}{x+1}\right|$

D) $\text{Arcsec}(x-1)$ E) $\text{Arctan}(x-1)$

V The graphs of $y = x^2 + 1$ and $x^2 - y^2 = 1$ have the following points in common:
A) (1, 2) and (–1,2) B) (1,0) C) (0,1) D) (1,0), (–1,0), (0,1), and (0,–1) E) none of these

E **GO 4 5 !!!!!**

S 1. You **MAY** use your graphing calculator on the Part B multiple choice problems and you **MUST NOT** use it on the Part A problems or the I problems.

F #135 1998 Free Response (4 and 5) **AND** AP Practice Exam #4 in Barron's book mod4,res2 (2,6,10…)

I It's ALL review!!!!! Just 5!!!!!

V If the curve of the equation $ky^2 + xy = 2 - k$ passes through the point $(-2, 1)$, then k equals
A) 0 B) –2 C) 1 D) –1 E) 2

E **5 — GOTTA HAVE IT !!!!!**

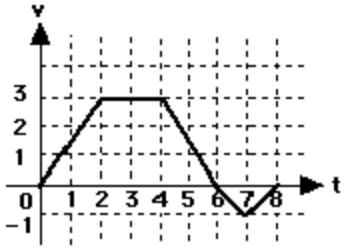
S 1. You **MAY** use your graphing calculator on the Part B multiple choice problems and you **MUST NOT** use it on the Part A problems .

AP CALCULUS FIVES

F #136 1998 Free Response (3) **AND** AP Practice Exam #4 in Barron's book mod4,res3 (3,7,11…)
I It's ALL review!!!!! Just 5!!!!!
V N'Sync has **5** band members!
E Remember: Think **5**…**5**…**5**…**5**…**5**…**5**…**5** !!!!!!!!!!
S 1. You **MAY** use your graphing calculator on the Part B multiple choice problems and you **MUST NOT** use it on the Part A problems .
2. Special SAT 9 Schedule next week -- Juniors and Sophomores be ready to SHINE on the SAT NINE!

F #137 1998 Free Response (6) **AND**
AB Multiple Choice Worksheet (2,6,10,14,20,24,28,32,36,40,44)
I It's ALL review!!!!! Just 5!!!!!
V A circle has center at (2,– 1) and is tangent to the line $x + 2y + 5 = 0$. Its equation is
A) $x^2 + y^2 – 4x + 2y = 10$ B) $x^2 + y^2 – 4x + 2y = 0$ C) $(x – 2)^2 + (y + 1)^2 = 25$
D) $x^2 + y^2 + 4x – 2y$ E) none of these
E Remember: Think **5** . . . **5** . . . **5** . . . **5** . . . **5** !!!!!
S 1. Problems from the 1996, 1995, 1994, 1992, 1987–1991 Worksheets and Free Response questions.
2. Oil is being pumped continuously from a certain well at a rate proportional to the amount of oil left in the well; that is, $\frac{dy}{dt} = ky$, where y is the amount of oil left in the well at any time t. Initially there were 1,000,000 gallons of oil in the well, and 6 years later there were 500,000 gallons remaining. It will no longer be profitable to pump oil when there are fewer than 50,000 gallons remaining.
(a) Write an equation for y, the amount of oil remaining in the well at any time t.
(b) At what rate is the amount of oil in the well decreasing when there are 600,000 gallons of oil remaining?
(c) To not lose money, at what time t should oil no longer be pumped from the well?

F #138 1998 Free Response (1,2) AB multiple choice worksheet (4,8,12,16,21,30,38,39)
AND 1–4 below:



A bug begins to crawl up a vertical wire at time t = 0. The velocity v of the bug at time t, $0 \le t \le 8$, is given by the function whose graph is shown above.
1. At what value of t does the bug change direction?
A) 2 B) 4 C) 6 D) 7 E) 8
2. What is the total distance the bug traveled from t = 0 to t = 8?
A) 14 B) 13 C) 11 D) 8 E) 6
3. The graph of the function $y = x^3 + 6x^2 + 7x – 2\cos x$ changes concavity at x =
A) –1.58 B) –1.63 C) –1.67 D) –1.89 E) –2.23

4. Let f be the function given by $f(x) = 2e^{4x^2}$. For what value of x is the slope of the line tangent to the graph of f at $(x, f(x))$ equal to 3?
   A) 0.168 B) 0.276 C) 0.318 D) 0.342 E) 0.551

I Smashmouth says: I'd walk on the sun for a **5** !!
V Michael, Tito, Jermaine, . . . — the Jackson **5 !!!**
E Did you realize that the **FIFTH** digit in the approximation of p is **5** ???!!!
Gotta Have It !
S Problems from the 1996, 1995, 1994, 1992, 1987–1991 Worksheets and Free Response questions.

F #139 1999 Free Response (1,2) **AND** Worksheet #69
I It's ALL review!!!!! Just 5!!!!!
V Today is the **5** th month!!!
E Think **5** . . . **5** . . . **5**.
S **Saturday's workshop is in rooms 116 and 117. Listen in class for more details!!!!**

F #140 1999 Free Response (3,4) **AND** Worksheet #70
I It's ALL review!!!!! Just 5!!!!!
V None
E Did you know that the sum of the first three digits in the approximation of e is equal to two times **5** !!!!! **5 – Just Do It !!**
S Problems from the 1996, 1995, 1994, 1992, 1987–1991 Worksheets and Free Response questions.

F #141 1999 Free Response (5,6) **AND** Worksheet #71
I **Don't forget the workshop tomorrow (Saturday) in rooms 116/117 from 8 to 11am.**
V Make the final **DRIVE FOR 5** !!!!!
E **Today is the 5 th day (minus two) in month 5** .
S You **WILL** do it —— **5 5 5 5 5**

F #142 Worksheet #72
I None
V Make the final **DRIVE FOR 5** !!!!!
E **Don't forget the workshop today after school in rooms 116/117** Get a good night's sleep! Have an early dinner! You'll be great! You will do it!
S You **WILL** do it —— **5 5 5 5 5**

F #143 Evaluation
I None
V None
E 1. Go over Raise test. 2. Discuss the AP test. 3. Other surprises.
S A time to reflect.

5 . . . 5 . . . 5 . . . 5 . . . 5 – You Will Do It!
It's A FIVES Odyssey!!!

F #144 See p.569-576.
Separate into partial fractions (do not integrate):

1. $\dfrac{3x-2}{x^2-4}$ 2. $\dfrac{3x+1}{x^2-4x+3}$ 3. $\dfrac{4x-11}{2x^2+7x-4}$ 4. $\dfrac{x^2-x+4}{x^3-3x^2+2x}$ 5. $\dfrac{1}{x^2(x+3)}$

I 1. $\left|(-2)^3-1\right|$ = (A) –9 (B) –7 (C) 5 (D) 7 (E) 9

2. In a certain week Jose ran an average of 6.3 km per day. How many km did Jose run that week?
(A) 0.9 (B) 9.0 (C) 42.1 (D) 44.1 (E) 441.0

V The height of a right circular cylinder is four times the radius of its base, and its volume is $108p$. What is the height of the cylinder ?

E 1. To continue our reward for your hard work towards a 2000 or a 5!
2. To learn how to separate a fraction into partial fractions to facilitate integration.
3. What to do if one of the factors is a power other than a first power.

S Separate into partial fractions and find the sum of the letters found:

1. $\frac{3x+2}{x^2-4}$ 2. $\frac{5x-13}{x^2-5x+6}$ 3. $\frac{x+4}{x(x-2)(x+5)}$ 4. $\frac{x+1}{x^2(x-1)}$ 5. $\frac{6x+7}{(x+2)^2}$ 6. $\frac{x^2+3x-2}{x^3+4x}$

F #145 p. 576 (1–7)

I 1. If x = 2 and y = 3, then $5x(4xy^2-11xy)$ =
(A) –180 (B) –30 (C) 15 (D) 60 (E) 90

2. $\frac{a-b}{\frac{1}{a}-\frac{1}{b}}$ = A) –ab B) ab C) $(a-b)^2$ D) a^2+b^2 E) a^2b-ab^2

V f $x \neq 0$, then the slope of $x\sin\frac{1}{x}$ equals zero whenever

(A) $\tan\frac{1}{x}=x$ (B) $\tan\frac{1}{x}=-x$ (C) $\cos\frac{1}{x}=0$ (D) $\sin\frac{1}{x}=0$ (E) $\tan\frac{1}{x}=\frac{1}{x}$

E Separate a fraction into partial fractions to facilitate integration.

S 1.) $\frac{1}{x^2+2x}$ 2.) $\frac{2x+1}{x^2-7x+12}$ 3.) $\frac{x^4+9}{x^4+9x^2}$ 4.) $\frac{x^3}{(x-1)^2}$

F #146 Separate into partial fractions and find the value of the letters for the partial fractions and then add them together. 1. $\frac{5x-13}{x^2-5x+6}$ 2. $\frac{x+4}{(x+1)^2}$ 3. $\frac{1}{x^2+2x}$ 4. $\frac{x+1}{x^3-x^2}$ 5. $\frac{x^2-3x-7}{(2x+3)(x+1)^2}$

I 1. If a = –3 and b = 7, then (a–b)(a+2b) =
(A) –110 (B) –21 (C) 10 (D) 44 (E) 170

2. $\frac{1}{a}-\frac{1}{b}$ = (A) $\frac{b-a}{a-b}$ (B) $\frac{b-a}{ab}$ (C) $\frac{a-b}{ab}$ (D) b–a (E) 0

V The sales tax on a $6.00 meal is $0.36. At this rate what would be the tax on a $14.00 meal?
A) $0.48 B) $0.72 C) $0.84 D) $0.90 E) $0.96

E 1. To learn how to separate a fraction into partial fractions to facilitate integration.
2. A look at what happens when a factor in the denominator is not linear.

S Separate into partial fractions and find the sum of the letters found:

1. $\frac{4}{(3x-1)^2(x-1)}$ 2. $\frac{x^2-x+4}{x^3-3x^2+2x}$ 3. $\frac{x^2}{(x-1)(x+1)^2}$ 4. $\frac{x^3-7}{x^4+x^2}$

AP CALCULUS FIVES

F #147

1. Separate these complex fractions using Partial Fractions.
2. Find the value of the letters for the partial fractions and then add them together.

1. $\frac{2x+1}{x^2-1}$ 2. $\frac{7x+1}{x^2+x-6}$ 3. $\frac{x-1}{x^3-x^2-2x}$ 4. $\frac{3}{x(x^2+9)}$

5. $\frac{1}{x^2(x+1)^2}$ 6. $\frac{1}{(x^2+1)(x+2)}$ 7. $\frac{12-8x}{x^2(x^2+4)}$

I 1. $\frac{1}{1+\frac{1}{x}}$ = (A) x+1 (B) $\frac{x+1}{x}$ (C) $\frac{x}{x+1}$ (D) $\frac{x}{2}$ (E) $\frac{x+1}{2x}$

2. $(2x^2)^5$ = (A) $2x^7$ (B) $2x^{10}$ (C) $32x^7$ (D) $32x^{10}$ (E) $32x^{32}$

V Page 489 (7) (Show all work for credit)

E 1. Learn how to separate a fraction with a complex fraction to a simpler one in order to facilitate integration.

S Separate into partial fractions and find the sum of the letters found:

1. $\frac{x^2-3x+2}{x^3+4x}$ 2. $\frac{1}{(x+1)(x^2+1)}$ 3. $\frac{x^2+2x+1}{(x^2+1)^2}$

F #148 Separate these complex fractions using Partial Fractions.
Also, find the value of the letters for the partial fractions and then add them together.

1. $\frac{8x+1}{x^2+x-2}$ 2. $\frac{x+18}{3x^2+17x+20}$ 3. $\frac{2x+4}{(x-1)^2}$ 4. $\frac{3x+5}{(x^2+1)(x+2)}$

5. $\frac{4}{x^2-6x+5}$ 6. $\frac{x+1}{x^3+x}$ 7. $\frac{6x^2-17x+25}{(x-1)(x-2)(x-3)}$ 8. $\frac{2x-1}{(x-1)^2}$

I 1. A theater has 25 rows, each with 12 seats. At a certain performance there were, on the average, 3 empty seats per row. What was the attendance at theat performance?
A) 225 B) 264 C) 297 D) 300 E) 375

2. A rectangle has perimeter 24 and width 4. What is the area of the rectangle?
A) 12 B) 24 C) 32 D) 40 E) 80

V How many dollars will x pens cost if 5 such pens cost y dollars?

A) $\frac{xy}{5}$ B) $\frac{5}{xy}$ C) 5xy D) $\frac{y}{5x}$ E) $\frac{x}{5y}$

E Review for the **test** on partial fractions.

S 1. $\frac{2x^2+5x+5}{x^3+2x^2-x-2}$ 2. $\frac{-2x+4}{(x^2+1)(x-1)^2}$ 3. $\frac{x^2-x+5}{(x+1)(x^2+x+1)}$ 4. $\frac{x^2+2x+1}{(x^2+1)^2}$

5. $\frac{x^4-2x^2+3}{(x^2+1)(x-1)}$

F #149 Separate these complex fractions using Partial Fractions.
Also, find the value of the letters for the partial fractions and then add them together.

1. $\frac{5}{x^2+x-2}$ 2. $\frac{x}{(x+1)^2(x-2)}$ 3. $\frac{5}{(x-1)(x^2+4)}$ 4. $\frac{5x-2}{x^2-4}$ 5. $\frac{5x^2+20x+6}{x^3+2x^2+x}$

6. $\frac{2x^2+5x-1}{x(x-1)(x+2)}$ 7. $\frac{x^2-x+4}{x^3-3x^2+2x}$ 8. $\frac{3x^2+x+4}{x^3+x}$ 9. $\frac{1}{x(x+1)^2}$

I 1. "3, 6, 9, 12, . . . " In the sequence to the left, each term after the first is 3 greater than the preceding term, Which of the following could NOT be a term in the sequence.

A) 333 B) 270 C) 262 D) 240 E) 225

2. 25 percent of 16 is equivalent to $\frac{1}{2}$ of what number? A) 2 B) 4 C) 8 D) 16 E) 32

V In a sack there are exactly 48 marbles, each of which is either red, black, or yellow. The probability of randomly selecting a red marble from the sack is $\frac{5}{8}$, and the probability of randomly selecting a black marble from the sack is $\frac{1}{8}$. How many marbles in the sack are yellow?

A) 6 B) 12 C) 16 D) 18 E) 24

E Review for the test tomorrow on partial fractions.

S Some "notes" problems to get ready for the test.

F #150 Read p.294–296 about the Substitution method of integration ("u-du")
Do p.296 (5,17,19,20) Follow the instructions given in the book. **Do not** integrate the way we have done it in the past—use the substitution method shown in the text.

I 1. The solution set of $\frac{7}{x^2 + 8x + 23} = 1$ is A) {8,4} B) {8,–4} C) {–4,–4} D) {4,–4} E) {16,1}

2. Given the equation $\frac{7x}{3} = (a^4 + 1)^3$, and a = –1, solve for x. A) 16 B) $\frac{24}{7}$ C) 24 D) $\frac{20}{3}$ E) 0

V Page 489 (32 Do not evaluate integral)

E 1. **Take easy test on Partial Fractions**.
2. Begin the "u–du" substitution method of integration that will be used by your college professors.

S None

F #151 Read p.622–628. Do p.628 (1,2,6,8,11,19,21,25,27)

I 1. A line l with slope 2 passes through the origin. Which of the following is a point on line l?
A) (2,4) B) (2,2) C) (2,1) D) (2,–1) E) (2,–4)

2. A solution of $3x^2 + 1 = 2x$ is x =

A) $-1 - i\sqrt{2}$ B) $-1 + i\sqrt{2}$ C) $1 + i\sqrt{2}$ D) $\frac{-1 + i\sqrt{2}}{3}$ E) $\frac{1 + i\sqrt{2}}{3}$

V p.629 (78) Show all work necessary. See p.627.

E Learning about sequences. Determining if a sequence converges or diverges—and finding the limit of a convergent sequence.

S See table 8.1 on page 625. Find the limit as $x \to \infty$ of the following:

1. $\frac{\ln(n^2)}{n}$ 2. $\sqrt[n]{n^2}$ 3. $\sqrt[n]{3n}$ 4. $\left(-\frac{1}{2}\right)^n$ 5. $\left(\frac{n-2}{n}\right)^n$ 6. $\frac{100^n}{n!}$

F #152 p.628 (4,9,12,16,17,22,26,28,31)

I 1. $\frac{\frac{1}{x} - 1}{\frac{1}{x}}$ = A) –1 B) 1 – x C) –x D) $\frac{1}{x^2 - 1}$ E) $\frac{1}{x^2} - \frac{1}{x}$

2. One root of the equation $x(x - 1) = 1$ is

A) 1 B) 2 C) $\frac{1 + \sqrt{5}}{2}$ D) $\frac{1 - \sqrt{3}}{2}$ E) $\frac{-1 + \sqrt{3}}{2}$

V p.629 (76) Show all work necessary. See p. 627

E Learning about sequences. Determining if a sequence converges or diverges—and finding the limit of a

convergent sequence.

S See table 8.1 on page 625.

F #153 p. 628 (3, 5, 7, 10, 14, 18, 20, 23, 24, 32)

I 1. Find the <u>third</u> term in the expansion for $(3x - y)^4$

2. Solve for n: $nC_2=36$

V p.629 (77) Show all work necessary. See p. 627

E Learn some theorems to help determine if a sequence converges or diverges.
Find the limit of a convergent sequence.

S See table 8.1 on page 625

F #154 Worksheet #73

I None

V $\int \sin^4 x \cos^3 x \, dx =$

E To clarify your values on tolerance and to contemplate their implementation.

S None

F #155 Worksheet #74

I None

V $\frac{dy}{dx} = \frac{p\cos(px)}{\sqrt{y}}$, and y = 1 when $x = \frac{1}{2}$. Find y

E To clarify your values on tolerance and to contemplate their implementation.

S None

F #156 Evaluate the following integrals using the substitution method.

1. $\int x \sin(2x^2)\, dx$ 2. $\int x^3(x^4 - 1)^2\, dx$ 3. $\int \frac{9x^2\, dx}{\sqrt{1 - x^3}}$

4. $\int \sin^5(x/3)\cos(x/3)\, dx$ 5. $\int x^{1/2} \sin\left(x^{3/2} + 1\right) dx$

I 1. If $\frac{3}{4/g} = (7 - a)g$, then a must equal A) $\frac{4}{3}$ B) $\frac{16}{3}$ C) 5 D) $\frac{25}{4}$ E) 17

2. If $2^{(6x-8)} = 16$, then x = A) 2 B) 4 C) 10 D) 1 E) 6

V A survey of 100 students showed that 75 were taking a math class, 37 were taking a science class, and 15 were taking neither. How many students were taking both a math and science class?
A) 22 B) 27 C) 60 D) 85

E A look at the "u–du" substitution method of integration that will be used by your college professors.

S Lots!!

F #157 Evaluate the following integrals using the substitution method.

1. $\int \left(1 - \cos(x/2)\right)^2 \sin(x/2)\, dx$ 2. $\int 8x\sqrt{x^2 - 1}\, dx$ 3. $\int \frac{3}{(2 - x)^2}\, dx$ 4. $\int \frac{\sin(2x + 1)}{\cos^2(2x + 1)}\, dx$

5. $\int x^3 (1 + x^4)^3\, dx$

I 1. The product (sin ß)(cos ß)(tan ß)(sec ß)(cot ß) is equivalent to
A) sin ß B) tan ß C) cot ß D) cos ß E) csc ß

2. The roots of $x^2 + 2x + 5 = 0$ are A) 3,4 B) $-1 \pm 2i$ C) $3 \pm 4i$ D) 6,3 E) $2 \pm 3i$

AP CALCULUS FIVES

V Which of the following is the equivalent of $\dfrac{1}{N + \dfrac{1}{N}}$?

A) 1 B) $\dfrac{1}{2N}$ C) $\dfrac{2}{N}$ D) $\dfrac{N}{N+1}$ E) $\dfrac{N}{N^2 + 1}$

E A look at the "u–du" substitution method of integration that will be used by your college professors.

S 1. $\displaystyle\int \frac{x^3}{1 + x^4}\,dx$ =

AP CALCULUS FIVES

F #158 Worksheet #75

Find u, du, and k for the following, set up the integral by substitution, then find solution.

I 1. The solution set to the system: $\begin{cases} 2x+3y=6 \\ y-2=\dfrac{2x}{3} \end{cases}$ is is

A) {0,2} B) {0,0} C) $\left\{\frac{1}{3},5\right\}$ D) {8,3} E) infinite number of solutions

2. $\dfrac{2x-8}{x+1}$ divided by $\dfrac{3x^2-12x}{x^2-1}$ = A) $\dfrac{2}{x^2}$ B) $\dfrac{3x^2}{2}$ C) $\dfrac{2}{3}(16-x)$ D) $\dfrac{2(x-1)}{3x}$ E) $\dfrac{x-5}{6x}$

V **Collect Extra Credit Money TOMORROW!!!**

E Continue the "u–du" substitution method of integration that your college professor will probably use.

S 1. $\int \cos 3t\sqrt{2+\sin 3t}\,dt$ =

EXTRA CREDIT MONEY DUE TODAY!!!

F #159 Worksheet #76

Find u, du, and k for the following, set up the integral by substitution, then find solution.

I 1. A triangle has a base of length 13 and the other two sides are equal in length. If the lengths of the sides of the triangle are integers, what is the shortest possible length of a side?

2. In a stack of six cards, each card is labeled with a different integer 0 through 5. If two cards are selected at random without replacement, what is the probability that their sum will be 3 ?

V **EXTRA CREDIT MONEY COLLECTED TODAY!!!**

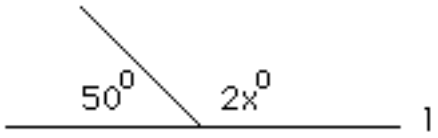
E Continue the "u–du" substitution method of integration that your college professor will probably use.

S Get ready for the upcoming test!!

F #160 Worksheet #77

Find u, du, and k for the following, set up the integral by substitution, then find solution

I



1. In the figure above, what is the value of x ?
2. If $(x+2)^2 = 25$ and $x > 0$, what is the value of x^2 ?

V None

E Review u – du method of integration and limits examination tomorrow.

S 1. $\displaystyle\int \frac{3x}{\sqrt[3]{x^2-1}}\,dx$ 2. $\displaystyle\int \frac{3x}{x^2+1}\,dx$ 3. $\displaystyle\int \frac{3}{x^2+1}\,dx$ 4. $\displaystyle\int \frac{3x}{x^4+1}\,dx$

F #161 Read p 734-737, examples 1–7. Do p.741 (1,2,8,9,10).

Identify the particles path by finding a Cartesian equation for it.

I If $f(x) = x^3 + Ax^2 + Bx - 3$ and if $f(1) = 4$ and $f(-1) = -6$, what is the value of $2A + B$?

A) 12 B) 8 C) 0 D) –2 E) Cannot be determined

V None

E Take easy examination on the u–du method of integration.

S None

AP CALCULUS FIVES

F #162 p.741 (13,18,20) p.743 (39a,b, 40a,b, 41) Sketch graph.
I $\ln(3e^{x+2}) - \ln(3e^{x}) =$ A) 2 B) e^2 C) 2ln3 D) ln3 + 2 E) 2ln3 + 2
V None
E 1. Introduction to parametric equations
2. Look at parameterization of curves graphically.
S 1. $x = 4\cos t$, $y = 2\sin t$, $0 \le t \le 2\pi$
2. $x = 1 - t$, $y = \sqrt{t}$, $t \ge 0$

F #163 Use your calculator in parametric mode to graph the following.
Sketch the graph on your paper. Indicate the window you used.
1. $x = y^2 - 6y + 8$
2. $f(x) = x^3 + x$; graph $f^{-1}(x)$
3. A satellite is in orbit around a planet that is orbiting around star.
The satellite makes 12 orbits each year. Its path is given by the parametric equations:
$x = 4\cos t + \cos 12t$ and $y = 4\sin t + \sin 12t$ Graph the satellite's path.

I. 1. Let f^{-1} be the inverse function of $f(x) = x^3 + 2$. Then $f^{-1}(x) =$

(A) $\frac{1}{x^3 - 2}$ (B) $(x+2)^3$ (C) $(x-2)^3$ (D) $\sqrt[3]{x+2}$ (E) $\sqrt[3]{x-2}$

V. None
E. 1. Use the parametric mode on your calculator to graph functions.
2. You need to bring your calculator to class today.
S. 1. $x = 2y^2 + y - 7$ 2. $f(x) = 2x^3 - x + 1$; graph $f^{-1}(x)$

F #164 Worksheet #78. A pair of equations is given which represents a curve parametrically. Choose the alternative that is the derivative $\frac{dy}{dx}$.

I. 1. If $h(x) = \frac{x^2 + 1}{x^2}$ where $x > 1$, then $h^{-1}(x) =$

A) $\frac{1}{\sqrt{x-1}}$ B) $\sqrt{\frac{x}{1+2x}}$ C) $\frac{-1}{\sqrt{x}}$ D) $\frac{1}{\sqrt{x-1}+1}$ E) $\frac{1}{-\sqrt{x-1}}$

V. None
E. Learn how to take derivatives of parametrically defined functions.
S. 1. $x = 2\sin\theta$ and $y = \cos 2\theta$ 2. $x = t^2 + t$ and $y = \frac{1}{1-t}$
3. Find the equation of the tangent to the curve in example #1 for $q = \frac{p}{6}$.

F #165 Worksheet #79
I. 1. The values of x for which the graphs of $y = x + 2$ and $y^2 = 4x$ intersect are
A) –2 and 2 B) –2 C) 2 D) 0 E) none of these
V. None
E. Prepare for an easy test tomorrow on parametric equations.
S. Lots of review problems

AP CALCULUS FIVES

F #166 Find the length of the curve $y = \frac{4\sqrt{2}}{3}x^{3/2} - 1$ from x = 0 to x = 1.

$$Formula: L = \int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx = \int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dy = \int_a^b \sqrt{\left(\frac{dx}{dy}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$$

I. None
V. None
E. Take easy examination on the parameterization of curves.
S. None

F #167 Read Chapter 5 section 5 p.393-398 (see formula above). Find the length of the curve:

1. $y = \frac{1}{3}(x^2+2)^{3/2}$ from $x = 0$ to $x = 3$

2. $y = x^{3/2}$ from (0,0) to (4,8)

3. $y = \frac{x^3}{3} + \frac{1}{4x}$ from $x = 1$ to $x = 3$

4. $x = \frac{y^4}{4} + \frac{1}{8y^2}$ from $y = 1$ to $y = 2$

I. None
V. None
E. 1. Introduction to arc length
2. Evaluation activity.
S. Juniors and Sophomores:
Prepare for an examination next week on the topic of length of a curve.

F #168 Worksheet #80
I None
V None
E Prepare for test on topic of length of a curve.
S

1. $f(x) = x^{3/2} + 2$ on $0 \le x \le \frac{4}{3}$ $\left(\text{ans: } \frac{56}{27}\right)$
2. $y = 2x + 3$ on $1 \le x \le 5$ $\left(\text{ans: } 4\sqrt{5}\right)$
3. $y = \frac{1}{3}(x^2 + 2)^{3/2}$ on $0 \le x \le 3$ $\left(\text{ans: } 12\right)$
4. $y = \frac{2}{5}x^{5/4} - \frac{2}{3}x^{3/4}$ on $1 \le x \le 16$ $\left(\text{ans: } \frac{256}{15}\right)$
5. $x = 5 - t^2$ and $y = t^2 + 3t$ on $0 \le t \le 3$ $\left(\text{ans: approx. } 153\right)$

F #169 Worksheet #81
I None
V None
E Prepare for test on topic of length of a curve.
S None

F #170 Worksheet #82 1. Sign up for Calculus B/C. 2. Be an aide!!!
I Have a fun and safe summer!!
V We'll see you in September!!
E 1. Take an easy test on length of an arc. 2. Work with improper integrals.
S 1. $\int_0^\infty \frac{dx}{x^2+1}$ 2. $\int_0^1 \frac{dx}{\sqrt{x}}$ $\left(ans: 1.\frac{p}{2}\ 2.2\right)$
Look at the examples about improper integrals.

AP CALCULUS FIVES

F #171 Study the handout on slope fields, especially example 1. On graph paper, draw a slope field For the following differential equation. Using [-3,3] X [-3,3]

1. $\frac{dy}{dx} = 2x$

I. None

V. None

E. Take easy examination on limits of sequences and parameterization of curves.

S. None

F. #172 Worksheet #81 (1-6)

I. None

V. None

E. Introduction to Slope Fields
Evaluation activity

S. Juniors and sophomores-Prepare for test next week on slope fields.

F. #173 Worksheet #81 (7-20)

I. None

V. None

E. Prepare for test

S. Example 3&4 on handout

F. #174 Worksheet #82 (30-34)

I. None

V. None

E. Prepare for test

S. None

F. #175 Worksheet #83

1. Sign up for Calculus BC
2. Be an "AIDE"

I. Have a fun and safe summer

V. We'll see you in September

E. Take an easy test on slope fields

S. Calc-U-Later