A P Calculus FIVES

F=Fun at home **I**=Incunabula **V**=Variety **E**=Endeavors **S**=Specimens

Thursday, October 26

F #39.5 Worksheet #15.5 #1-15

I 1. $f'(x) = \cos^3(2x)$, and $f(\frac{\pi}{4}) = 2$. Find the function $f(x)$.

V p.330 #68 (b)

E The gift of an extra day to study for a test on integrals --- Tomorrow!!

S Study your homework – especially the problems you did incorrectly the first time!

Friday, October 27

F #40 Find the antiderivative of each of the following, given $\int a^x dx = \frac{1}{\ln a} a^x + C$

1. $\int 2^x dx$ 2. $\int 5^x dx$ 3. $\int_0^1 2^{-\theta} d\theta$ 4.. $\int e^{3x} dx$ 5. $\int_1^2 \frac{2^{\ln x}}{x} dx$

I SAT sponges 65, 66

V p.330 #68 (c)

E **1. Take an easy multiple–choice test on integrals.**

2. Find the integral where the exponent has a variable ("special technique").

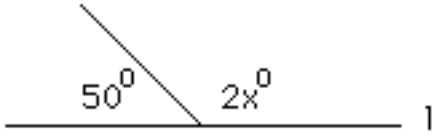
S 1. SUCCESS comes from your intense, dedicated preparation!!

Monday, October 30

F #41 Do the following ten problems on a separate sheet of paper.

1. Find $\frac{dy}{dx}$ if $y = 3^{-x}$
2. Find $\frac{dy}{ds}$ if $y = 2^{s^2}$
3. Find $\frac{dy}{dt}$ if $y = 2^{\sin 3t}$
4. Find $\frac{dy}{dx}$ if $y = (x+1)^x$
5. Find $\frac{dy}{dx}$ if $y = x^{x+1}$
6. Find $\frac{dy}{dx}$ if $y = x^{\sin x}$
7. $\int 1.3^x dx$
8. $\int_{-2}^{0} 5^{-\theta} d\theta$
9. $\int_1^{\sqrt{2}} 2^{x^2} x dx$
10. $\int_0^{\frac{\pi}{2}} 7^{\cos t} \sin t dt$

I 1. In the figure to the right, what is the value of x ?



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

V p.338 #47

E Find the derivative and integral where the exponent has a variable ("special technique").

S **Seniors:** Get those applications completed!!!

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Tuesday, October 31

F #42 p. 84 #11-16, 23, 24

I SAT sponges 67, 68

V p.85 #50

E Determine if a function is continuous at a point.

S 1. $f(x) = \frac{x^2-9}{x-3}$ for $x \neq 3$ and $f(x) = 6$ when $x = 3$. Is $f(x)$ continuous at $x = 3$?

2. If $f(x) = 7$ when $x = 3$, would $f(x)$ be continuous at $x = 3$?

Wednesday, November 1

F #43 p. 84 #1-10, 19, 20, 49

I 1. $\lim_{x\to 4} \frac{x^3-4x^2-x+4}{x-4} =$ 2. $\int \sin(4x + 2)\, dx =$

V $\int \sin^5 x\, dx =$

E 1. Another day determining if functions are continuous at a point.

S 1. If $f(x) = \frac{x^2-25}{x-5}$ if $x \neq 5$, and 10 if $x=5$, then is $f(x)$ continuous at $x=5$?

2. If $f(x) = \frac{x^2+5x+6}{x^2-3x-10}$ if $x \neq -2$ and 5, and $f(-2) = k$, then find k so that f is continuous at $x = -2$.

3. If $f(x) = \frac{1-\cos x}{x}$ if $x \neq 0$, and $f(0) = k$, then find k so that f is continuous at $x = 0$.

4. If $f(x) = x^2 - 4$ for $x < 3$, and $2kx$ for $x \geq 3$, then find k so that f is continuous at $x = 3$.

Thursday, November 2

F #44 Read p.196–198. Do the Worksheet #16 1–10

I SAT sponges 71, 72

V p.202#8

E 1. To learn the Mean Value Theorem 2. To learn the special case of the MVT, Rolle's Theorem.

S Find c for the Mean Value Theorem if 1. $f(x) = x^2 - 7x$ 2. $f(x) = 3x^2 - 5x + 1$

Find c for Rolle's Theorem if 1. $f(x) = x^2 - 2x$ on $[0,2]$. 2. $f(x) = 2x^2 - 3x + 1$ on $[1/2,1]$

Friday, November 3

F #45 Worksheet #17 1–16

I SAT sponges 73, 74

V p.202 #6

E 1. Review the Mean Value Theorem, Rolle's Theorem, and continuity of a function.

S 1. Find c for Rolle's Theorem if $f(x) = x^2 - 2x - 3$ on $[-1,3]$.

2. Find c for the Mean Value Theorem if $f(x) = 2x^2 + 1$ in $[1,3]$.

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Monday, November 6

F #46 Worksheet #18 1–17

I SAT Sponges 77, 78

V If $f(x) = x \cos \frac{1}{x}$, then $f'\left(\frac{2}{\pi}\right) =$ A) $\frac{\pi}{2}$ B) $-\frac{2}{\pi}$ C) -1 D) $-\frac{\pi}{2}$ E) 1

E 1. Review Mean Value Theorem, Rolle's Theorem, continuity, and higher level thinking on these topics for test Thursday.

S 1. Why does $f(x) = \frac{x^2-4x}{x-2}$ on [0,4] **not** satisfy the hypotheses of Rolle's Theorem?

Tuesday, November 7

F #47 Worksheet #19 1–13

I 1. Which of the following integers is a divisor of both 36 and 90? A) 12 B) 10 C) 8 D) 6 E) 4

2. Point B is between points A and C on a line. If AB = 2 and BC = 7, then AC = A) 2 B) 3 C) 5 D) 7 E) 9

V The equation of the tangent of the curve $y = e^x \ln x$, where $x = 1$, is

A) $y = ex$ B) $y = e^x + 1$ C) $y = e(x - 1)$ D) $y = ex + 1$ E) $y = x - 1$

E Review MVT, Rolle, continuity, variables separable, and anything else for upcoming test.

S 1. Solve: $\frac{dy}{dx} = \frac{x+1}{y-1}$ 2. $f(x) = \frac{x^2-16}{x-4}$ when $x = 4$ and $f(4) = k$.

Find k so that f is continuous at $x = 4$.

Wednesday, November 8

F #48 Worksheet #20 1–13

I SAT Sponges 79, 80

V Suppose $\int_0^3 f(x + k)\,dx = 4$, where k is a constant. Then $\int_k^{3+k} f(x)\,dx$ equals

A) 3 B) $4 - k$ C) 4 D) $4 + k$ E) none of these

E Final review MVT, Rolle, continuity, variables separable, and anything else for test tomorrow.

S Lots of problems for your notes.

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Thursday, November 9

F #49 1. Find $\frac{dS}{dt}$ if $S = 4\pi r^2$. 2. Find $\frac{dV}{dt}$ if $V = \frac{1}{3}\pi r^2 h$.

3. Find $\frac{dz}{dt}$ if $x^2 + y^2 = z^2$. 4. If $x = 4$, $y = 3$, $\frac{dy}{dt} = -2$, and $\frac{dx}{dt} = 0$, then find $\frac{dz}{dt}$ for $x^2 + y^2 = z^2$.

5. If $V = \frac{4}{3}\pi r^3$ and $\frac{dV}{dt} = 3\pi$ and $r = 6$, then find $\frac{dr}{dt}$

6. Using variables separable, solve the differential equation $\frac{dy}{dx} = \frac{3y}{x}$ if $x = 1$ when $y = 1$.

I SAT Sponges 81, 82

V If $f(x) = x^5 + 2$, then its inverse function $f^{-1}(x)$ is

A) $\frac{1}{x^5 + 2}$ B) $\sqrt[5]{x + 2}$ C) $\sqrt[5]{x} + 2$ D) $\frac{1}{\sqrt[5]{x} - 2}$ E) $\sqrt[5]{x - 2}$

E 1. **Take an easy test** on continuity, Rolle's Theorem, Mean Value Theorem, and variables separable.

2. Prepare for related rate problems.

Situation: Test. What to do: Study. Results: Success!! Success often depends on the right attitude! Think A+!

Monday, November 13

F #50 Read pp. 246-249. Do p.251 # 2,3,11,19

I SAT Sponges 85, 86

V p.252 #18 (a)

E Learn the easy steps in solving related rates problems.

S 1. A ladder 15 ft long is leaning against a building. The bottom of the ladder is moved away from the building at the constant rate of $\frac{1}{2}\ \frac{\text{ft}}{\text{sec}}$. Find the rate at which the ladder is falling down the building when the ladder is 9 ft from the building.

2. Sand falls onto a conical pile at the rate of $10\ \frac{\text{ft}^3}{\text{min}}$. The radius of the base of the pile is always equal to one half its altitude. How fast is the altitude increasing when it is 5 ft. deep?

3. Water is withdrawn from a conical reservoir 8 ft in diameter and 10 ft deep (vertex down) at the constant rate of $5\ \frac{\text{ft}^3}{\text{min}}$. How fast is the water level falling when the depth of water in the reservoir is 6 ft?

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Tuesday, November 14 **Late Start**

F #51

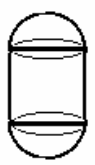
1. A balloon is being filled with helium at the rate of 4 cubic $\frac{\text{ft}}{\text{min}}$ The rate, in square feet per minute, at which the surface area is increasing when the volume is $\frac{32\pi}{3}$ cubic feet is
   (A) 4π (B) 2 (C) 4 (D) 1 (E) 2π
2. A circular conical reservoir has depth 20 feet and radius of the top 10 feet. Water is leaking out so that the surface is falling at the rate of $\frac{1}{2}\ \frac{\text{ft}}{\text{hr}}$ The rate, in cubic feet per hour, at which the water is leaving the reservoir when the water is 8 feet deep is
   (A) 4π (B) 8π (C) 16π (D) $\frac{1}{4\pi}$ (E) $\frac{1}{8\pi}$
3. The height of a rectangular box is 10 inches. Its length increases at the rate of 2 $\frac{\text{in}}{\text{sec}}$; its width decreases at the rate of 4 $\frac{\text{in}}{\text{sec}}$. When the length is 8 inches and the width is 6 inches, the volume of the box is changing, in cubic inches per second, at the rate of
   (A) 200 (B) 80 (C) –80 (D) –200 (E) –20
4. A 26 foot ladder leans against a building so that its foot moves away from the building at the rate of 3 $\frac{\text{ft}}{\text{sec}}$. When the foot of the ladder is 10 feet from the building, the top is moving down at the rate of r $\frac{ft}{\text{sec}}$, where r is (A) $\frac{46}{3}$ (B) $\frac{3}{4}$ (C) $\frac{5}{4}$ (D) $\frac{5}{2}$ (E) $\frac{4}{5}$

I SAT Sponges 87, 88

V p.179 (30 answer both parts)

E More practice with related rates.

S A balloon is in the shape of a cylinder with hemispherical ends of the same radius as that of the cylinder. The balloon is being inflated at the rate of $261\pi\ \frac{\text{cm}^3}{\text{min}}$. At the instant the radius of the cylinder is 3 cm, the volume of the balloon is 144π cm^3 and the radius is increasing at the rate of 2 $\frac{\text{cm}}{\text{min}}$. (The volume of a cylinder is $\pi r^2 h$ and the volume of a sphere is $\frac{4}{3}\pi r^3$)



1. At this instant, what is the height of the cylinder?
2. At this instant, how fast is the height of the cylinder changing?

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