

**CALCULUS I - Worksheet #23**

1. If  $f(x) = x \ln x$ , then  $f'''(e)$  equals  
A)  $\frac{1}{e}$     B) 0    C)  $-\frac{1}{e^2}$     D)  $\frac{1}{e^2}$     E)  $\frac{2}{e^3}$
- 
2. 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 of these
- 
3. The only function that does not satisfy the Mean Value Theorem on the interval specified is  
A)  $f(x) = x^2 - 2x$  on  $[-3, 1]$ .    B)  $f(x) = \frac{1}{x}$  on  $[1, 3]$ .    C)  $f(x) = \frac{x^3}{3} - \frac{x^2}{2} + x$  on  $[-1, 2]$ .  
D)  $f(x) = x + \frac{1}{x}$  on  $[-1, 1]$ .    E)  $f(x) = x^{2/3}$  on  $[\frac{1}{2}, \frac{3}{2}]$ .
- 
4.  $\lim_{x \rightarrow \infty} \frac{3+x-2x^2}{4x^2+9}$  is A)  $-\frac{1}{2}$     B)  $\frac{1}{2}$     C) 1    D) 3    E) nonexistent
- 
5. If  $f(x) = \begin{cases} x^2 & \text{for } x \leq 1 \\ 2x - 1 & \text{for } x > 1 \end{cases}$ , then  
A)  $f(x)$  is not continuous at  $x = 1$   
B)  $f(x)$  is continuous at  $x = 1$  but  $f'(1)$  does not exist  
C)  $f'(1)$  exists and equals 1    D)  $f'(1) = 2$   
E)  $\lim_{x \rightarrow 1} f(x)$  does not exist
- 
6. If  $y$  is a differentiable function of  $x$ , then the slope of the curve of  $xy^2 - 2y + 4y^3 = 6$  at the point where  $y = 1$  is  
A)  $-\frac{1}{18}$     B)  $-\frac{1}{26}$     C)  $\frac{5}{18}$     D)  $-\frac{11}{18}$     E) 2
- 
7. A 35-ft ladder leans against a building so that its foot moves away from the building at the rate of 3 ft/sec. When the foot of the ladder is 21 ft from the building, the top is moving down, in ft/sec, at the rate of  
A)  $\frac{43}{4}$     B)  $\frac{7}{4}$     C)  $\frac{9}{4}$     D)  $\frac{9}{2}$     E)  $\frac{4}{5}$
- 
8. Which of the following is a point of discontinuity for  $f(x) = \frac{x^2 4}{x^2 + 2x3}$ ?  
A) -3    B) 2    C) 0    D) -1    E) -2
- 
9.  $\int_1^2 \frac{3x^2 2}{x^3} dx =$     A)  $\ln 2 - 1$     B)  $\ln 8 - \frac{3}{4}$     C)  $3 \ln 2$     D)  $-\frac{1}{4}$     E)  $\ln 2 + 1$
- 
10. If the surface area of a sphere is increasing at the rate of 12 sq. ft. per second, how fast, in terms of ft. per second, is radius increasing when it is 2 ft.?

- A) 1      B)  $\frac{1}{\pi}$       C)  $\pi$       D)  $\frac{2}{\pi}$       E)  $\frac{3}{4\pi}$
- 

11. If  $f(x) = \begin{cases} x+1 & x \leq 1, \\ 3+ax^2 & x > 1 \end{cases}$  continuous for  $a =$

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

12. The volume  $V(\text{in}^3)$  of unmelted ice remaining from a melting ice cube after  $t$  seconds is  $V = 2000 - 40t + 0.2t^2$ . How fast is the volume changing when  $t = 40$  seconds?

- A)  $-26 \text{ in}^3/\text{sec}$     B)  $24 \text{ in}^3/\text{sec}$     C)  $120 \text{ in}^3/\text{sec}$     D)  $0 \text{ in}^3/\text{sec}$     E)  $-24 \text{ in}^3/\text{sec}$
- 

13. Find  $c$  for the Mean Value Theorem for the function  $f(x) = x^3 - 12x$  on  $[-2, 2]$ .

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

14. Find the values of  $c$  that satisfy Rolle's Theorem for  $f(x) = x^4 - x$  on  $[0, 1]$ .

- A) .5      B)  $\frac{1}{4}$       C)  $\frac{1}{2}$       D)  $\sqrt[3]{\frac{1}{4}}$     E)  $\sqrt[3]{\frac{1}{2}}$
-