

Math 124

March 14, 2007

Test #3

Name _____

(please print = 1)

Show Your Work!

Good Luck!

1. Calculate these 5 derivatives (**Do not simplify** once all derivatives are calculated.)

Show work (no work = no points) and **put boxes around your final answers.**

(a) $D(\sec(x^3 + 5^x)) =$

(4)

(b) $\frac{d}{dw} \ln(w + \sin(w)) =$

(4)

(c) Use **log. differentiation**: $\frac{d}{dx} (2 + x)^{\sin(x)} =$

(5)

(d) $f(x) = e^{Ax} + B\sin(x) + \frac{5}{x^2}$. Calculate $f''(x) =$

(5)

(e) The reference book says $\frac{d}{dx} \ln(x) = \frac{1}{x}$.

(5) Then $\frac{d}{dx} \ln(x^3 + 2) =$

2. $f(x) = \sqrt[3]{x} = x^{1/3}$.

(a) Find the equation of the tangent line (call it $L(x)$) at the point $(27, 3)$. $L(x) =$ _____

(5)

(b) $L(29)$ is an approximation of $\sqrt[3]{29}$. $L(29) =$ _____

(2)

3. Use L'Hospital's Rule to determine the limits of these indeterminate forms.

(a) $\lim_{x \rightarrow 1} \frac{3^x - 3}{x - 1} =$ _____

(5)

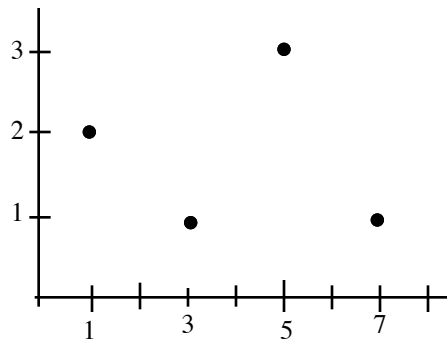
(b) $\lim_{x \rightarrow \infty} \frac{\ln(1 + x^2)}{3 + \sqrt{x}} =$ _____

(5)

4. The function f is continuous and differentiable on the interval $0 < x < 8$. The values for f , f' and f'' at some locations are given in the table. Sketch the graph of a function f which satisfies all of the given information.

(8)

x	f(x)	f'(x)	f''(x)
1	2	0	-
3	1	1	+
5	3	-1	0
7	1	-2	+



5. True or False (Print the whole word) (2 points each)

_____ If $g(x)$ has a local maximum at $x=5$ then $g'(5) = 0$.

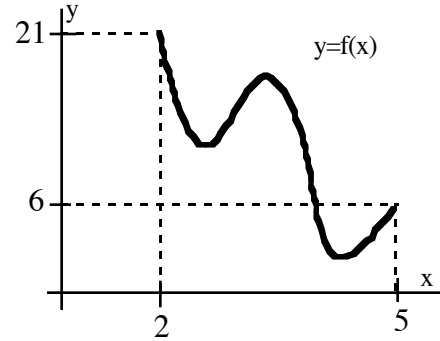
_____ If $f''(3) < 0$, then f has a local maximum at $x = 3$.

_____ If $g(1) = 0 = g(4)$, then there is a c between 1 and 4 so that $g'(c) = 0$.

_____ If $\lim_{x \rightarrow 2} f(x) = 0$, then $\lim_{x \rightarrow 2} f(x)/g(x) = 0$

6. A graph of $y = f(x)$ is shown.

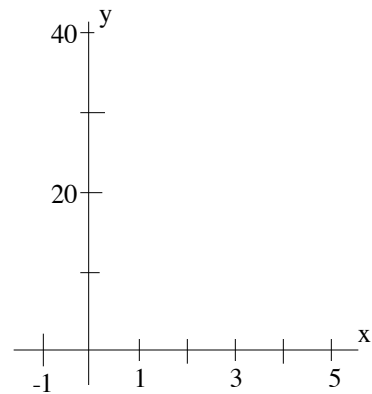
- (a) According to the Mean Value Theorem, there is
 (3) a point c between 2 and 5 so that $f'(c) =$ _____
 (b) On the graph label the locations of all of the c 's that
 (3) satisfy the Mean Value Theorem.



7. $f(x) = x^3 - 6x^2 + 38$ on the interval $-1 \leq x \leq 5$. Use CALCULUS to answer these.

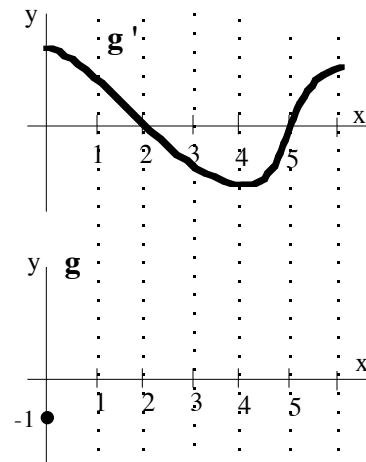
- (a) f has critical numbers at $x =$ _____ (2)
 (b) f has local maximum(s) at $x =$ _____ (2)
 (c) The global maximum value of f is _____ (2)
 at $x =$ _____ (2)
 (d) According to the Mean Value Theorem, there is a c
 between -1 and 5 so that $f'(c) =$ _____ (2)
 (e) Sketch a **good** graph of f (4)

(Show your **calculus** work. No work = no points.)



8. g is a continuous and differentiable function, and $g(0) = -1$.

- (5) Use the given graph of g' to sketch a good graph of $g(x)$.



9. $g(x) = Ax^3 - Bx^2$ (A and B are constants that are not equal to 0).

(a) Find all x so that $g'(x) = 0$. $x =$ _____

(3)

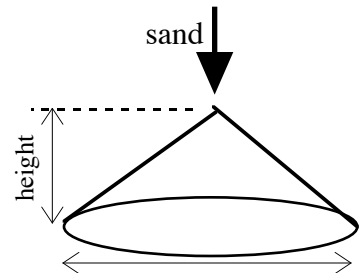
(b) Find all x so that $g''(x) = 0$. $x =$ _____

(2)

9. Dry sand is pouring at a steady rate onto the top of a conical pile whose bottom diameter is always three times the height of the pile. When the pile is 8 feet high the height is growing at a rate of 2 feet per hour. How fast is the sand pouring onto the pile?. ($V = \frac{1}{3}\pi r^2 h$)

_____ (a number & units)

(7)



10. I have 54 square inches of tin to build a rectangular box whose base is twice as long as its width. In this case if the width of the base is x inches, then the volume of the box is $V(x) = 36x - \frac{4}{3}x^3$ for $0 < x < 5.1$.

Use calculus to find the value of x which maximizes the volume. $x =$ _____

(Show your work.)

(6)

BONUS: (a) Find a function $f(x)$ so $f'(x) = 10e^{5x} + 6\sec^2(2x)$.

$f(x) =$ _____ (2)

(b) Name one college where David Blackwell taught: _____ (1)

The end!! (Tomorrow: test back & new material)