Math 151

Show Your Work! Nov. 19, 2019 Name ____________________________

Good Luck! Test #3 A *(please print)*

1. $x^3 + x^2y^3 + 6\sin(3y) = y^2 + 1$. (Show your work!)

(4) (a) Calculate y' at $(1, 0)$. $y' =$ ____________________

(3) (b) The equation of the tangent line to this curve at (1,0) is L(x) = ______________

(2) (c) Use the tangent line in part (b) to approximate y when x=1.03. $y \approx$ ________

(b) Use **log. differentiation**: $\frac{d}{dx}(\ 5 + \sin(x)\ )^x =$

(5) (circle your answer)

2. True or False (circle the correct answer)

(2) True False If g(x) is differentiable and decreasing for $1 \le x \le 6$ then $g'(4) < 0$.

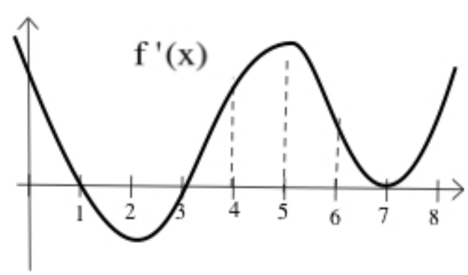
(2) True False If f(3) is a local maximum for f, then $f'(3) = 0$.

(2) True False If $g'(2)$ is undefined then g(2) is a local max or local min.

(2) True False If $\lim_{x \to 1} g(x) = \lim_{x \to 1} f(x) = 0$, and then $\lim_{x \to 1} \frac{f(x)}{g(x)} = 1$.

(2) True False If $f'(2)=0$ and $f''(2)<0$ then f has a local maximum at x=2.

3. The graph of **y = f '(x)** is shown.



(2) (a) At x=3 f has a local MAX MIN NEITHER (circle one).

(2) (b) At x=5 f has a local MAX MIN NEITHER (circle one).

(2) (c) At x = 7 f is INCREASING DECREASING NEITHER (circle one)

(2) (d) At x = 4 f is concave UP DOWN NEITHER (circle one)

(2) (e) f has an Inflection Point at x = _____

4. $f(x) = x^3 - 9x^2 + 24x + 3$ on the interval $-1 \le x \le 5$.
Use CALCULUS to answer these.

(4) (a) f has critical numbers at x = ____________________

(2) (b) f has local maximum(s) at x = ___________________

(2) (c) The global minimum value of f is _____________

(2) at x = _____________

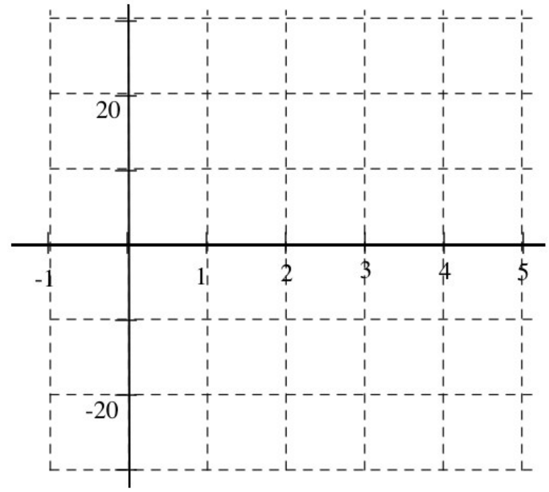
(2) (d) at x=2 the graph of f(x) is concave UP DOWN NEITHER

(2) (e) f has Inflection Point(s) at x = ______________

(4) (f) Sketch a **good** graph of f

(4) (g) According to the Mean Value Theorem there is a value x=c between -1 and 5 so that f '(c) = ____________

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

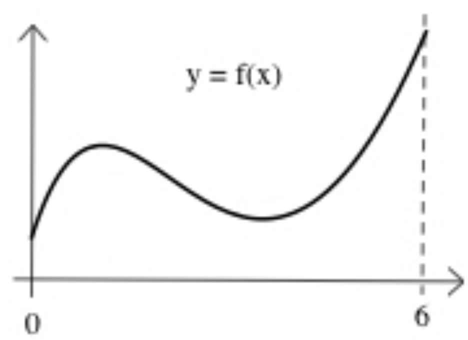


5. (a) The graph of y = f(x) is shown for 0≤x≤6.
Plot and label the location(s) of the c values

(2) from the Mean Value Theorem.

(b) According to the Mean Value Theorem, if the temperature increased 21 degrees from 1 PM to 8 PM then

(2) ____ (fill in)



6. $f'(x) = (x)(x-2)^2(x-5)$ (circle the correct answer)

(2) (a) At x=1 f is Increasing Decreasing Neither

(2) (b) At x=3 f is Increasing Decreasing Neither

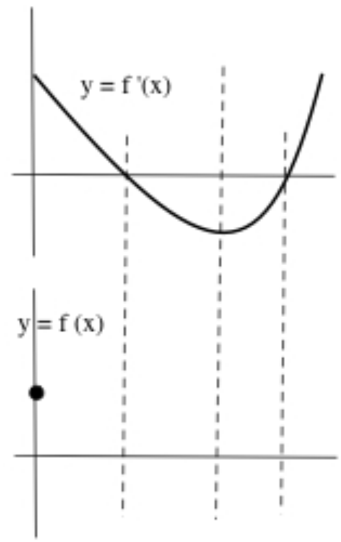
(2) (c) f(2) is LocalMax LocalMin Neither

(2) (d) f(5) is LocalMax LocalMin Neither

7. $f'(x) = 12x^3 + 8e^{2x} - 4\cos(x) + 5$ and $f(0) = 9$.

Then f(x) = ________________________________

(6)



8. The graph of $y = f'(x)$ is shown on the top graph and f(0) is the dot on the bottom graph. On the bottom axis sketch a good graph of y = f(x) .

(4)

9. On the given axes sketch a continuous function y = f(x) so that

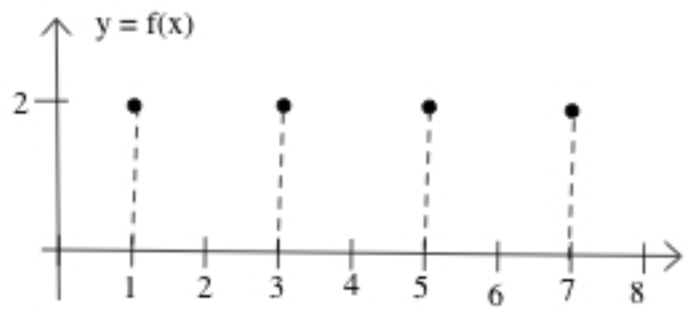
f(1) = f(3) = f(5) = f(7) = 2 (those points are on the figure)

(2) (a) $f'(1) = -1$ and $f''(1) > 0$

(2) (b) $f'(3) = 0$ and x=3 is NOT a local max or min of f

(2) (c) $f'(5) = -1$ and x = 5 is an Inflection Point of f

(2) (d) $f'(7)$ is undefined and f is decreasing at x=7



10. If the units of x are dollars and the units of y are miles then

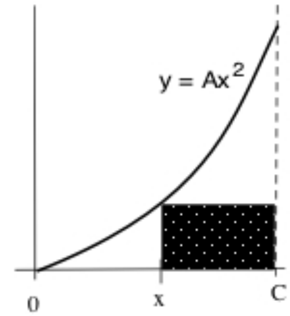
the units of $\frac{d^2y}{dx^2} = y''$ are ____________

(2)

11. Do **TWO** of these max/min problems. (If you do all 3 I will only grade A ad B. (6 points each)

(Show your work. Organize your work so I can understand it. No work = no points.)

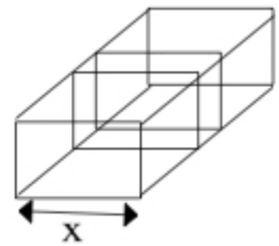
A. Find the value of x (in terms of A and C) that maximizes the shaded area.



x = ______________

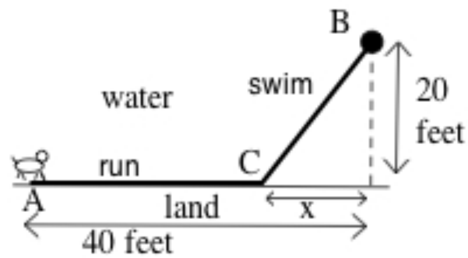
B. You have 150 square inches of tin to build a box (no top) that has two dividers (see figure) and is 2 times as long as it is wide (put x = width). What dimensions will maximize the volume? (integers or 2 decimal places)

x = width = ___________ length = ____________ height = ______________



C. Your very smart dog starts at A (see figure) and wants to reach the ball at B as quickly as possible. The dog can run at 5 feet/second and can swim at 2 feet/second. The dog runs along the land from A to C and then swims from C to B. What value of x will minimize the total time to reach the ball?

x = _____________ (2 decimal places)



A B C

A B C

BONUS (+2 if correct)

Name the two co-inventors of calculus: ________________ and _________________

The end!! (Total = 100 + 2 bonus.) Tests back tomorrow.