Math 151

Show Your Work! Nov. 20, 2018 Name ____________________________

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

1. **Show your work**. No work = no points.

 (a) Use **log. differentiation**: $y = \dfrac{(x+2)^3}{(x-3)^6(x+5)^4}$ (circle your answer)

(5) y' =

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

(5) (circle your answer)

2. True or False (circle the correct answer)

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

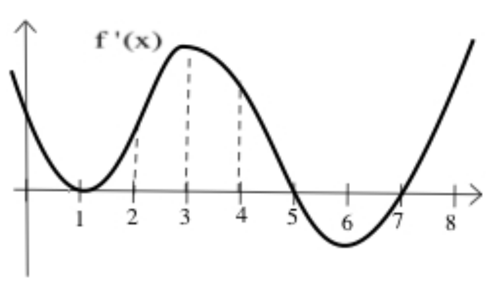
(2) True False If f(x) is differentiable and f(3) is a local maximum for f, then $f'(3) = 0$.

(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 $\lim_{x\to 1} \dfrac{f(x)}{g(x)}$ is undefined.

(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=5 f has a local MAX MIN NEITHER (circle one).

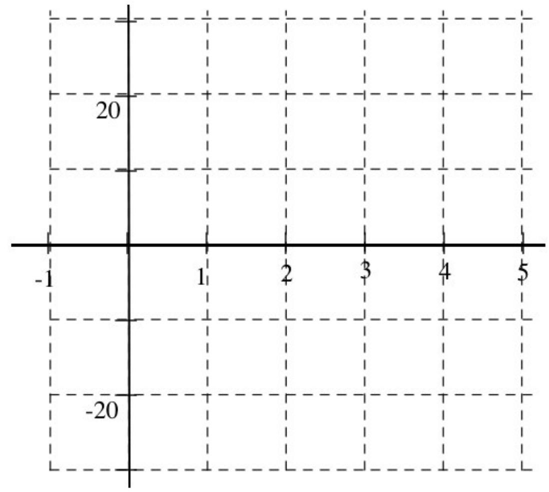
(2) (b) At x=1 f has a local MAX MIN NEITHER (circle one).

(2) (c) At x = 3 f is INCREASING DECREASING (circle one)

(2) (d) At x = 3 f is concave UP DOWN NEITHER (circle one)

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

4. $f(x) = x^3 - 6x^2 + 9x + 5$ 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=3 the graph of f(x) is concave UP DOWN NEITHER

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

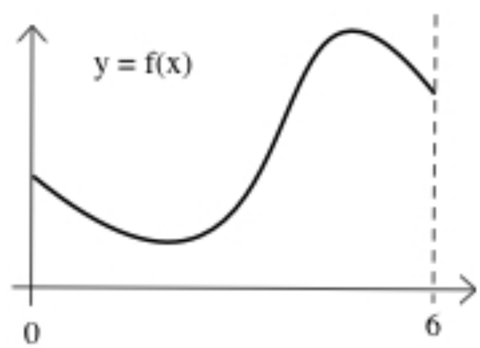
(4) (f) Sketch a **good** graph of f

(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)

(2) of the c values from the Mean Value Theorem.



(b) According to the Mean Value Theorem, if your average velocity driving from Seattle to Portland was 60 mph then

(2) ___________________________________ (fill in)

6. $f\ '(x) = (x-1)(x-4)^2(x-6)^2$ (circle the correct answer)

(2) (a) At x=0 f is Increasing Decreasing Neither

(2) (b) At x=5 f is Increasing Decreasing Neither

(2) (c) f(1) is LocalMax LocalMin Neither

(2) (d) f(6) is LocalMax LocalMin Neither

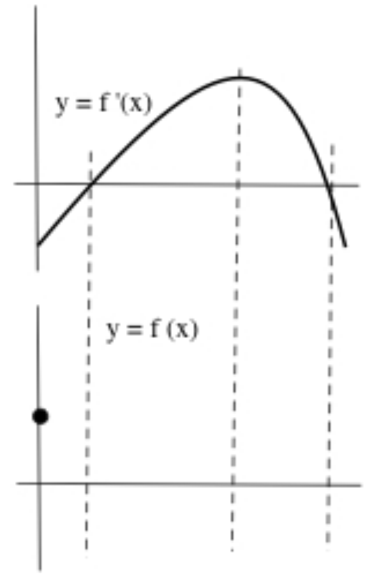
7. $f\ '(x) = 20x^4 + 6e^{3x} - 4\sin(x) + 1$ and $f(0) = 13$.

Then f(x) = ___________________________________

(6)

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

(4)



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

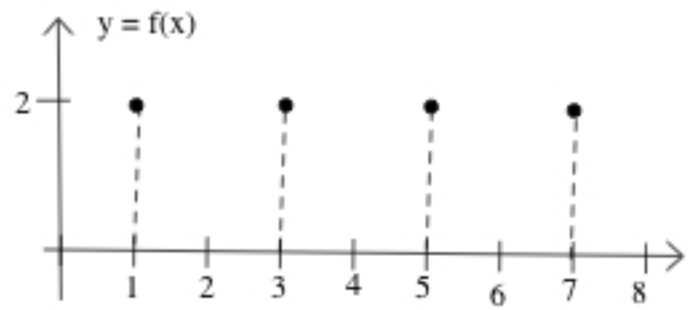
f(1) = f(3) = f(5) = f(7) = 2 (those points are on the figure)

(2) (a) f '(1) = –2 and f '' (1) < 0

(2) (b) f '(3) is undefined and f is increasing at x=3

(2) (c) f '(5) = 0 and x=5 is NOT a local max or min of f

(2) (d) f '(7) = 2 and x = 7 is an Inflection Point of f



10. If $f(x) = e^{(-x^2)}$ then $f\ '(x) = -2x \cdot e^{(-x^2)}$.

Then f has Inflection Point(s) at x = ________________

(4)

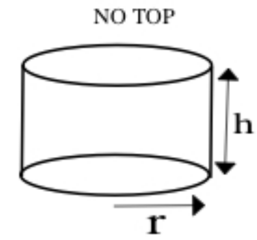
11. If the units of x are trees and the units of y are birds then

the units of $\dfrac{d^2y}{dx^2} = y''$ 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)

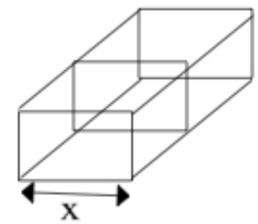
(Show your work. Organize your work so I can understand it. No work = no points.)



A. You have 96 square inches of tin to make into a cylindrical can (see figure). Use calculus to find the dimensions of the can will maximize the volume of the can.

(Data: $V = \pi r^2 h$, surface area $= \pi r^2 + 2\pi r h$)

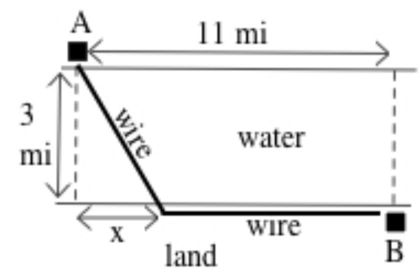
r= __________________ h = __________________ (2 decimal places)



B. You have 225 square inches of tin to build a box (no top) that has one divider (see figure) and is 3 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. You want to connect towns A and B with a cable (see figure). It costs \$8 per mile to put cable in water and \$2 per mile to put cable on land. What value of x will minimize the total cost of connecting A and B? x = ______________



BONUS (+2 if correct)

Name the two co-inventors of calculus: ___________________ and ____________________

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