Math 151

Show Your Work! January 23, 2018 Name ____________________________

Good Luck! Test #1 A (please print)

1. Use Fig. 1 to answer the following limit questions. (2 each)

(a) $\lim_{x\to 2} f(x) =$ _____ (b) $\lim_{x\to 3^-} f(x) =$ _____

(c) $\lim_{x\to 1^+} f(4-x) =$ _____ (d) $\lim_{x\to 1^+} f(2x+1) =$ _____

(e) $\lim_{h\to 0} \dfrac{f(2+h)-f(2)}{h} =$ _____

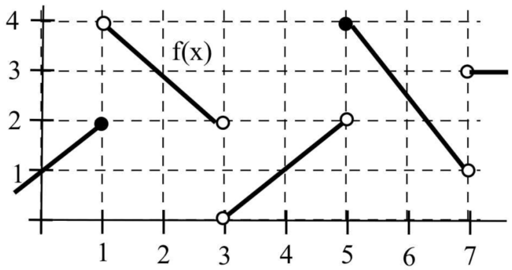

Fig. 1

2. Using the methods of this class calculate the following limits. (Show your work. No work = no points.)

(3) (a) $\lim_{x\to 3} \dfrac{x^2+4x-21}{x^2+x-12} =$ _____ (as an exact fraction)

(3) (b) $\lim_{x\to 1} \dfrac{3-|x-2|}{x^2+3} =$ ____________ (as an exact fraction)

(3) (c) $\lim_{x\to 3^-} \dfrac{INT(\ 1+x\ )}{x+2} =$ _____

(3) (d) $\lim_{x\to 0} \dfrac{3^x-1}{x} =$ __________ (to 2 decimal places)

3. Write the equation of the tangent line to the graph of $f(x) = x^2 + \dfrac{4}{x} - 3$ when x = 2 (show work!)

y = ____________________

(4)

4. See Fig. 6 (Circle the correct response in a and b.)

(2) (a) Point B is fixed. As A moves along the curve towards B, the slope of the AB line:

INCREASES or DECREASES or STAYS CONSTANT

(2) (b) Point D is fixed. As E moves along the curve towards D, the slope of the DE line:

INCREASES or DECREASES or STAYS CONSTANT

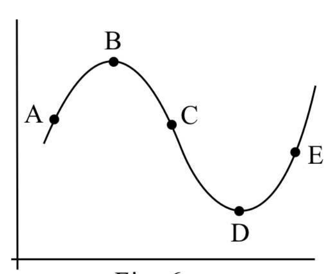

Fig. 6

5. Fig. 7 shows the **upward velocity** of a toy airplane during a period of several minutes.

(2) (a) From $t = 2$ to $t = 3$ minutes, the airplane was

RISING FALLING (circle one)

(2) (b) At what time was the airplane highest ?

t = ____________

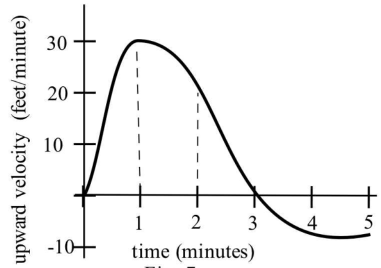

Fig. 7

6. $g(x) = \begin{cases} A + 2x & if \quad x < 1 \\ 3x + 1 & if \quad 1 \le x < 3 \\ 4x + B & if \quad x \ge 3 \end{cases}$

(a) Find A so g is continuous at x = 1. A = _____

(b) Find B so g is continuous at x = 3. B = _____

(2)(2)

7. (a) Carefully **define** the derivative

$$f\,'(x) = \frac{d\ f(x)}{d\ x} =$$

(4)

(b) Give one example of what $f\,'(3)$ measures?

(2)

(c) If the units of x are dogs and the units of f are birds ,

then the units of $\frac{d\ \mathrm{f(x)}}{d\ \mathrm{x}}$ are __________________

(2)

8. Fig. 10 shows the graph of y = f(x). On the lower part sketch the graph of y = { **slope** of f(x) } = f'(x). ----------------------

(4)

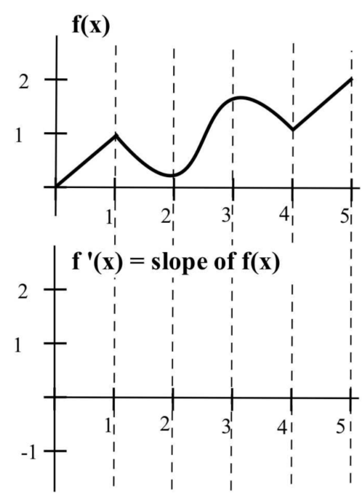

Fig. 10

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9. T(h) is the temperature (oC) at the height h meters ona hill. Clearly explain the meaning of T(500) = 33 and T '(600) = – 0.12 (Use complete sentences.)

(4)

10. Calculate these derivatives using the methods of this class -- show your work. **CIRCLE YOUR ANSWER**.

You do NOT need to simplify once you have taken all of the derivatives in a problem.

(a) $f(x) = Ax^5 - Bx^2 + 4x - 7^2$

$f\,'(x) =$

(b) $g(t) = \dfrac{5}{t^2} + 14\sqrt{t} + t^4$

$\dfrac{d\ g(t)}{dt} =$

(4 points each)

(c) (d) $h(x) = (7 + x^5) \cdot \sin(x)$

$D(\ h(x)\ ) =$

(d) $g(x) = (5 + 3x^4)^2$

$g\,'(x) =$

(e) $f(x) = 4x^5 + \dfrac{6}{x} + 5x^2$ $\quad D(\ D(\ f(x)\ )\ ) =$

(This is just the derivative of the derivative.)

(f) $D\left(\dfrac{x^2+5}{x+\cos(x)}\right) =$

(g) $D(\ \cos^3(x)\ ) =$

11. The values for f and g and their derivatives are given in the table. Use these values to find these derivatives. Each answer should be a number.

x	0	1	2
f(x)	2	4	2
f '(x)	3	-1	5

x	0	1	2
g(x)	3	0	4
g '(x)	1	-4	2

At x = 2 $D(\ 2+4f(x)+3g(x)\ ) =$ ______

(2 each)

At x=2 $D(\ f(x)\cdot g(x)\ ) =$ __________

At x=2 $D\left(\dfrac{f(x)}{1+g(x)}\right) =$ __________

12. $f(x) = x^3 - 3x^2 - 24x + 7$. Find all values of x so that f '(x)=0. x = _______________

(4)

13. If f '(x) is always negative and f(3) = 0 then (circle one)

(2) (a) f(2) < 0 (b) f(2) = 0 (c) f(2) > 0 (d) not enough information

14. If f(x) ≥0 for all x values, then (circle one)

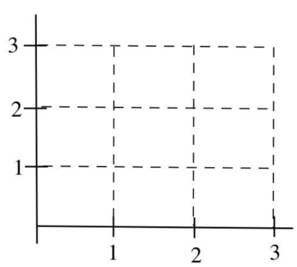
(2) (a) f '(x) is always positive (b) f '(x) is sometimes positive (c) f(2) > 0 (d) not enough information

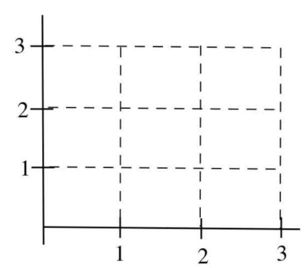
15. (a) Draw a function f for 1≤x≤3 so f(2)=1 and $\lim_{x\to 2} f(x) = 2$

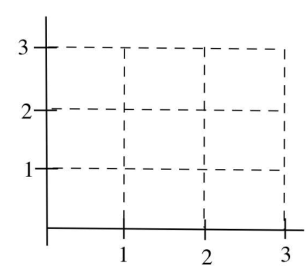
(b) Draw a function f for 1≤x≤3 so f(2)=2 and $\lim_{h\to 0} \dfrac{f(2+h)-f(2)}{h} = 2$

(c) Draw a continuous function f with f '(1)>0, f '(2)=0 and f '(3)>0

(2 each)







Bonus (+1 if correct)

Find a function f(x) so that $f\ '(x) = 15x^4 - 3\cos(x) + 5$. f(x) = __________________________

The End -- tests back tomorrow (Possible points = 102 + 1 bonus point)