Math 151

Show Your Work! Good Luck!

October 9, 2018 Test #1 A

Name ______________________ (please print)

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

(a) $\lim_{x \to 5} f(x) =$ _____ (b) $\lim_{x \to 1^+} f(x) =$ _____

(c) $\lim_{x \to 1^+} f(7-x) =$ _____ (d) $\lim_{x \to 1} INT(2x+1) =$ _____

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

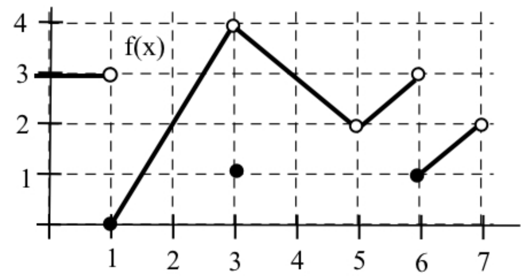


Fig. 1

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

(3) (a) $\lim_{x \to 2} \dfrac{x^2+3x-10}{x^2+x-6} =$ _____ (as an exact fraction)

(3) (b) $\lim_{x \to 2} \dfrac{1-|x-5|}{x^2-x} =$ ___________ (as an exact fraction)

(3) (c) $\lim_{x \to 4^-} \dfrac{INT(\ 2+x\ )}{x+3} =$ _____

(3) (d) $\lim_{x \to 0} \left\{ 4 + \dfrac{\sin(3x)}{2x} \right\} =$ _________ (to 2 decimal places)

3. Write the equation of the tangent line to the graph of $f(x) = x^3 + \dfrac{8}{x} - 3x$ when x = 2 (show work!)

y = ____________________

(4)

4. See Fig. 2. B is fixed. As A moves along the curve towards B,
the slope of the AB line: (circle one)

(2) INCREASES or DECREASES or STAYS CONSTANT

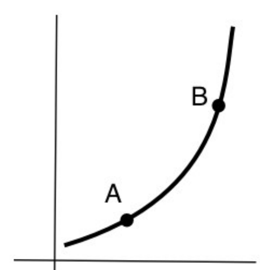


Fig. 2

5. F(w) is the number of flu cases in Washington on week w of flu season.
Translate the following into information that someone who does not know calculus can understand. Use complete sentences. " **F(4) = 87 and F ' (4) = 5** "

(4)

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

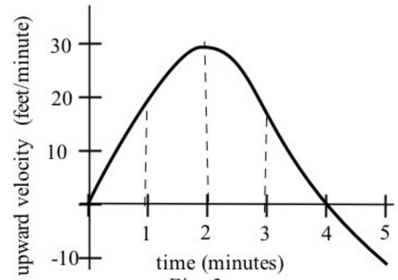


Fig. 3

(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 = ____________

7. $g(x)=\begin{cases} A+x^3 & if \quad x<1 \\ 5x+2 & if \quad 1\le x<4 \\ B-2x & if \quad x\ge 4 \end{cases}$ (a) Find A so g is continuous at x = 1. A = _____

(b) Find B so g is continuous at x = 4. B = _____

(2)(2)

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

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

(3)

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

(2)

(c) If the units of x are dollars and the units of f are meters ,

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

(2)

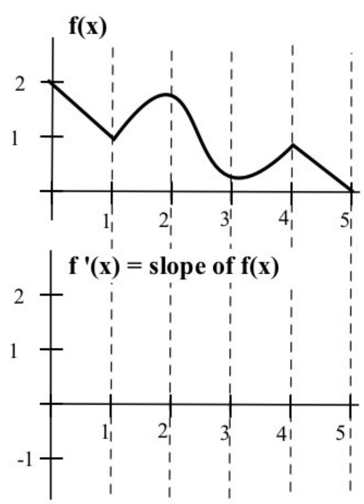


Fig. 4

9. Fig. 4 shows the graph of y = f(x). On the lower part sketch the graph of y = { **slope** of f(x) } = f'(x). ----------------------->>

(4)

10. True or False (write the entire word)

(1) _________ If $\lim_{x\to 3} f(x)=4$ then f(3) = 4

(1) _________ If g(x) is continuous at x=2 then g(x) is differentable at x=2.

11. 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) $f(x) = Ax^4 + Bx^3 - Cx + \pi$

$f\,'(x) =$

(b) $g(t) = \dfrac{4}{t^3} + 8\sqrt{t} + 2t^3$

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

(4 points each)

(c) (d) $h(x) = (x^2 + 7)\cdot\cos(x)$

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

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

$g\,'(x) =$

(e) $f(x) = 3x^4 + \dfrac{2}{x} + 6x$ $\qquad D(\ D(\ f(x)\ )\ ) =$

(This is just the derivative of the derivative.)

(f) $D\left(\dfrac{x^3 + 7}{x^2 + \sin(x)}\right) =$

(g) $D(\ |\ x - 3\ |\ ) =$

12. 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 = 0 $D(\ 1+2f(x)+3g(x)\ ) =$ ______

(2 each)

At x=1 $D(\ f(x)\cdot g(x)\ ) =$ __________

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

13. $f(x)=x^3+6x^2-36x+2$. Find all values of x so that f '(x)=0. x = ______________

(4)

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

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

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

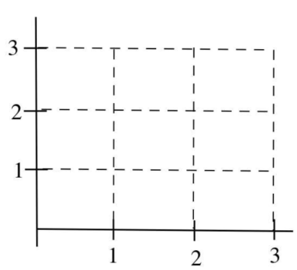
(2) (a) f '(x) is always positive (b) f '(x) is sometimes positive (c) f '(x) is never positive (d) not enough information

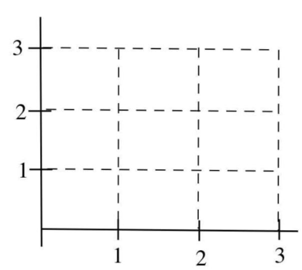
16. (a) Draw a function f for 1≤x≤3 so f(2)=3 and $\lim_{x\to 2} f(x)=1$

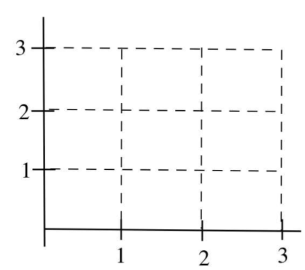
(b) Draw a continuous function f for 1≤x≤3 so that f(2)=2 and $\lim_{h\to 0}\frac{f(2+h)-f(2)}{h}=-1$

(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 $f\ '(x)=12x^3+4\sin(x)+7$. f(x) = ________________________

The End -- tests back tomorrow (Possible points = 101 + 1 bonus point)