Math 151

Show Your Work! October 8, 2019 Name _____
Good Luck! Test #1 A (please print)

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

(a) $\lim_{x\to 3} f(x) =$ _____ (b) $\lim_{x\to 6^+} f(x) =$ _____

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

(e) $\lim_{h\to 0} \dfrac{f(4+h)-f(4)}{h} =$ _____

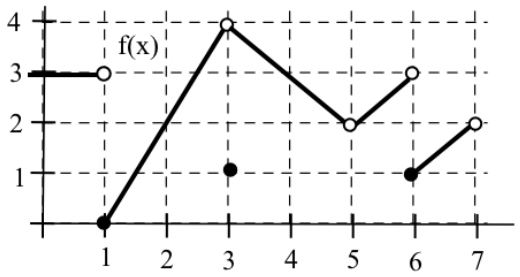


Fig. 1

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

(3) (a) $\lim_{x\to 2} \dfrac{x^2+x-6}{x^2+2x-8} =$ _____ (as an exact fraction)

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

(3) (c) $\lim_{x\to 1^-} \dfrac{INT(\,2+x\,)}{x+4} =$ _____

(3) (d) $\lim_{x\to 0} \left\{2+\dfrac{\sin(5x)}{3x}\right\} =$ _____ (to 2 decimal places)

3. Write the equation of the tangent line to the graph of $f(x) = x^3 + \dfrac{8}{x} - 3x + 1$ when x = 2 (show work!)

y = _____

(4)

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

(2) INCREASES or DECREASES or STAYS CONSTANT

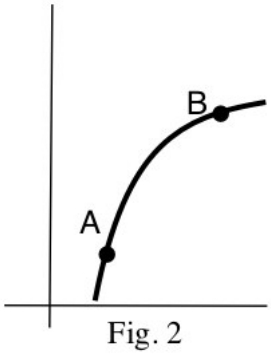


Fig. 2

5. F(w) is the number of fish in Pine Lake on week w of fishing season.
Translate the following into information that someone who does not know calculus can understand.
Use complete sentences. **" F(4) = 438 and F ' (4) = –72 "**

(4)

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

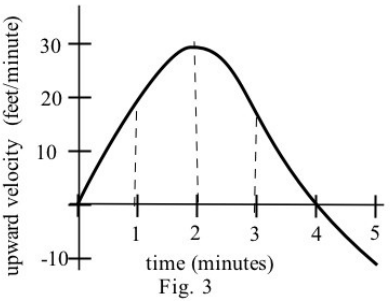


Fig. 3

(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. $g(x)=\begin{cases} A+x^2 & if \quad x<1 \\ 5x+1 & if \quad 1\le x<4 \\ B-3x & if \quad x\ge 4 \end{cases}$

(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 meters and the units of f are dollars , then the units of $\frac{d\ \mathrm{f(x)}}{d\ \mathrm{x}}$ are _____

(2)

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)

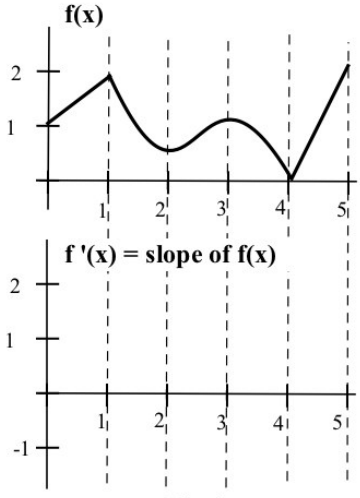


Fig. 4

10. True or False (write the entire word)

(1) _____ If f is a continuous function and $\lim_{x\to 3} f(x)=4$ then f(3) = 4

(1) _____ If g(x) is differentable at x=2 then g(x) is continuous 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) $f(x) = Ax^5 + Bx^2 - Cx + \pi^2$

(A, B, C are constants)

$f\,'(x) =$

(b) $g(t) = \frac{4}{t^2} + 6\sqrt{t} + 2t^5$

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

(4 points each)

(c) (d) $h(x) = (x^5 + 3) \cdot \sin(x)$

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

(d) $g(x) = (2x^3 + 1)^2$

$g\,'(x) =$

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

(This is just the derivative of the derivative.)

(f) $D\left(\frac{x^3 + 4}{x^2 + 5}\right) =$

(g) $D(\ |\ x - 4\ |\ ) =$

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

x	0	1	2
g(x)	2	0	3
g '(x)	1	-2	5

At x = 1 $D(\ 2+3f(x)+g(x)\ ) =$ _____ At x = 1 $D(\ f(x)\cdot g(x)\ ) =$ _____

(2 each)

At x=2 $D(\ x^2\cdot f(x)\ ) =$ _____ At x=0 $D\left(\frac{g(x)}{f(x)}\right) =$ _____

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

(4)

14. 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

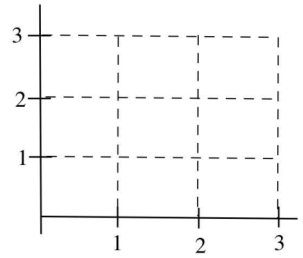
15. If f(x) ≤ 0 for all x values, then (circle one)

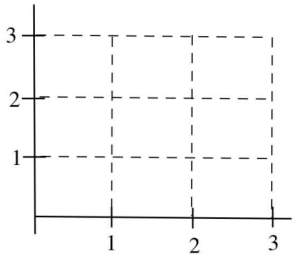
(2) (a) f '(x) is always positive (b) f '(x) is sometimes positive (c) f '(x) is never positive (d) not enough information

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

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

(2 each)





Bonus (+1 each if correct)

Find a function f(x) so that $f\ '(x) = 12x^3 + 3\sin(x) + 2$. f(x) = _____

What was on the wallpaper of Kovalevsky's childhood bedroom **or** what geological feature is named after her? ____

The End -- tests back tomorrow (Possible points = 101 + 2 bonus points)