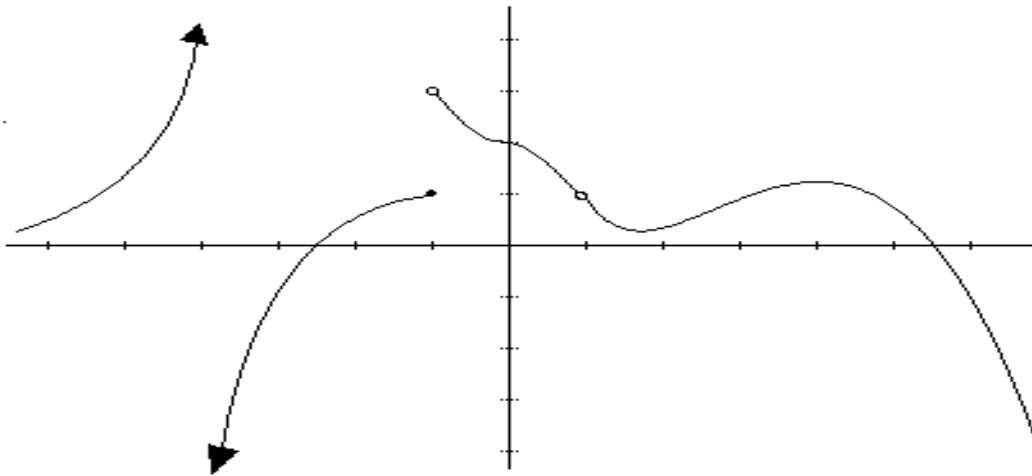


# EXAM 1

Name: \_\_\_\_\_

MATH 130S Cox  
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Below is given a graph of a function  $y=f(x)$ . Refer to it for 1 and 2.



1. For what values is the function discontinuous?

Discontinuities: \_\_\_\_\_

2. Evaluate each limit using the graph above.

$$\lim_{x \rightarrow -4^-} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -1^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -4^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -1} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -4} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 0} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -1^-} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 1} f(x) = \underline{\hspace{2cm}}$$

3. Show by example that  $\lim_{x \rightarrow a} [f(x) - g(x)]$  may exist even though  $\lim_{x \rightarrow a} f(x)$  and  $\lim_{x \rightarrow a} g(x)$  do not exist. (Give specific functions for  $f$  and  $g$  and a value for  $a$ .)

Evaluate the following limits.

4.  $\lim_{x \rightarrow 5} \frac{x-5}{x^2 + 2x - 35}$

Answer: \_\_\_\_\_

5.  $\lim_{x \rightarrow 0} \frac{1}{x^4}$

Answer: \_\_\_\_\_

6.  $\lim_{x \rightarrow 2^+} \frac{1}{x-2}$

Answer: \_\_\_\_\_

7.  $\lim_{x \rightarrow 2} \frac{1}{x-2}$

Answer: \_\_\_\_\_

8.  $\lim_{t \rightarrow 1} e^{2t-2} =$

Answer: \_\_\_\_\_

9.  $\lim_{t \rightarrow 0} \frac{\frac{1}{3+t} - \frac{1}{3}}{t} =$

Answer: \_\_\_\_\_

10.  $\lim_{t \rightarrow 0^+} \frac{|t|}{t} =$

Answer: \_\_\_\_\_

11.  $\lim_{t \rightarrow 0} \frac{|t|}{t} =$

Answer: \_\_\_\_\_

12.  $\lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x} =$

Answer: \_\_\_\_\_

13. Find the discontinuities of the function  $f(x) = \begin{cases} 3 & \text{if } x < -1 \\ x^2 + 2 & \text{if } -1 \leq x \leq 3 \\ 4 & \text{if } 3 < x \end{cases}$

Discontinuities: \_\_\_\_\_

14. With what linear function  $y=ax+b$  would you need to replace the middle function  $(x^2+2)$  in order to make the function continuous?

Answer: \_\_\_\_\_

15. Find the equation for the line tangent to the function  $f(x) = \frac{1}{x}$  at the point (2, 0.5). Show how you calculate the slope and give your answer in slope-intercept form.

Equation: \_\_\_\_\_

16. The position of a falling object at time  $t$  is given by  $f(t) = 4.9t^2$ .

a. Give the average velocity from  $t=0$  to  $t=2$ .

Average velocity: \_\_\_\_\_

b. Find the instantaneous velocity when  $t=2$ .

Instantaneous velocity: \_\_\_\_\_

For problems 17-23 find the *requested* derivative by any appropriate method.

17.  $F(x) = 3x^4 + 4x^3 + 6x^2 + 12x + 52$ . Find  $F'(x)$ .

Answer: \_\_\_\_\_

18.  $y = (x^3 - 2x)\sqrt{x}$ . Find  $y'$ .

Answer: \_\_\_\_\_

19. Let  $f(x) = x^{12} - 12x^2 + 9x + 42$ . Find  $f'''(x)$ .

Answer: \_\_\_\_\_

20.  $f(x) = \frac{1 + 2x + 3x^2 + 4x^3 + 5x^4}{x^4}$ . Find  $f'(x)$ .

Answer: \_\_\_\_\_

21. Let  $g(x) = \frac{1}{x-3}$ . Find  $g'(4)$ .

Answer: \_\_\_\_\_

22.  $h(x) = \frac{x^2 + 3x + 1}{x^2 - 10}$ . Find  $h'(x)$ , simplifying as appropriate.

Answer: \_\_\_\_\_

23.  $y = 6e^x + \frac{e^x + 15}{e^x}$ . Find  $y'$ .

Answer: \_\_\_\_\_

For 24 and 25, calculate the derivative of the given function directly from the definition, showing all steps.

24.  $f(x)=x^2+12x$

24.  $f(x)=\sqrt{x+3}$