

Name \_\_\_\_\_

Calculus Winter Extra Credit

Each correct answer is worth 2 points. This will be averaged into your grade as a test score. You will not be penalized for unanswered or incorrect answers.

1. Complete the Table and use the result to estimate the limit.

$$\lim_{x \rightarrow 2} \left( \frac{x-2}{x^2-4} \right)$$

$x$	1.9	1.99	1.999	2.001	2.01	2.1
$f(x)$						

2. Use the graph to find  $\lim_{x \rightarrow 1} f(x)$  if  $f(x) = \begin{cases} 3-x, & x \neq 1 \\ 1, & x = 1 \end{cases}$

3. Find  $\lim_{x \rightarrow 0} (2x - 1)^3$

4. Find  $\lim_{x \rightarrow -1} \left( \frac{x^2 + 1}{x} \right)$

5. Find  $\lim_{x \rightarrow -1} \frac{x^2 - 5x - 6}{x + 1}$

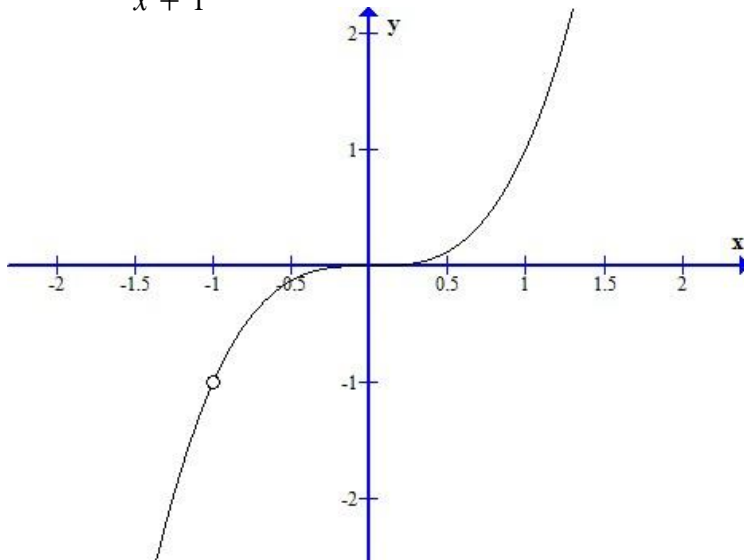
6. Find  $\lim_{x \rightarrow 0} \frac{\sqrt{6+x} - \sqrt{6}}{x}$

7. Find  $\lim_{x \rightarrow 0} \left[ \frac{1}{x+4} \right] - (1/4)$

8. If  $\lim_{x \rightarrow c} f(x) = -\frac{1}{2}$  and  $\lim_{x \rightarrow c} g(x) = \frac{2}{3}$ , find  $\lim_{x \rightarrow c} [f(x)g(x)]$

Use the graph and the function to determine the limit (if it exists)

$$f(x) = \frac{x^4 + x^3}{x + 1}$$

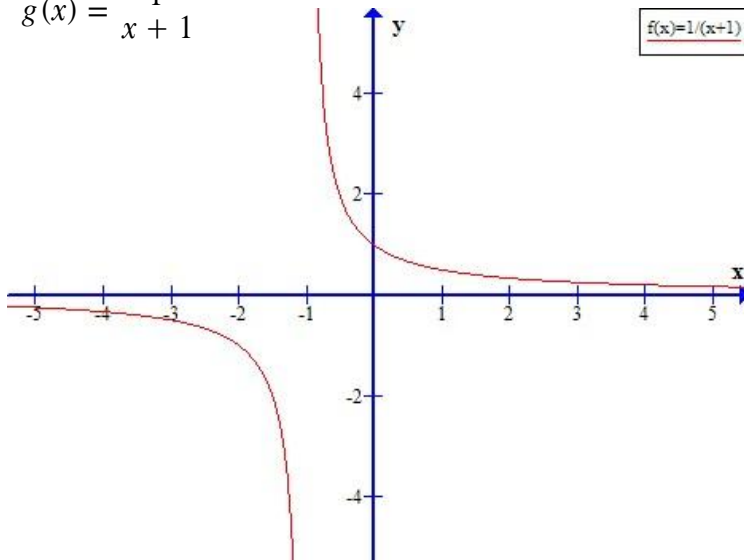


9)  $\lim_{x \rightarrow 2} f(x) =$

10)  $\lim_{x \rightarrow -1} f(x) =$

11)  $\lim_{x \rightarrow 1} f(x) =$

$$g(x) = \frac{1}{x + 1}$$

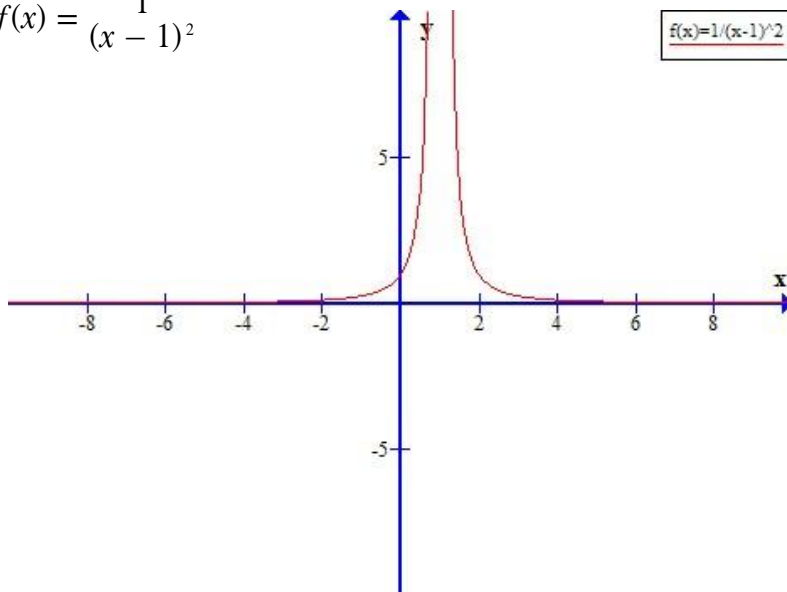


12)  $\lim_{x \rightarrow 0} g(x) =$

13)  $\lim_{x \rightarrow -1^-} g(x) =$

14)  $\lim_{x \rightarrow -1^+} g(x) =$

$$f(x) = \frac{1}{(x-1)^2}$$

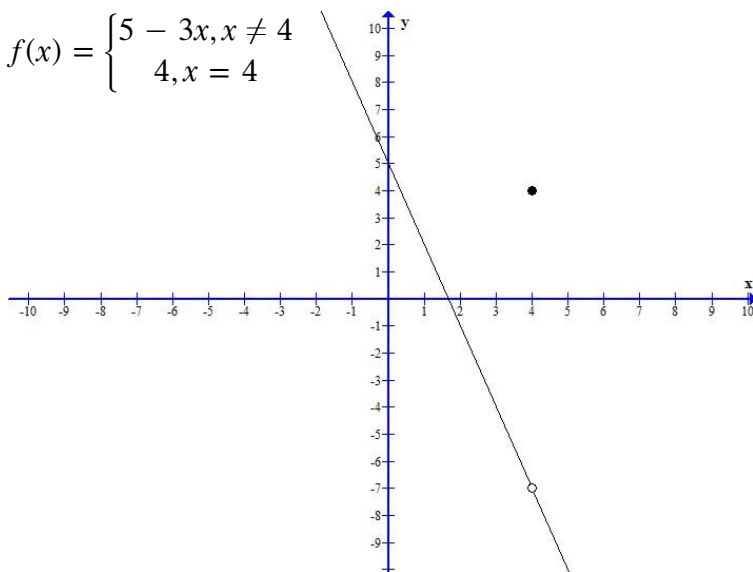


15)  $\lim_{x \rightarrow 1} f(x) =$

16)  $\lim_{x \rightarrow 1^-} f(x) =$

17)  $\lim_{x \rightarrow 1^+} f(x) =$

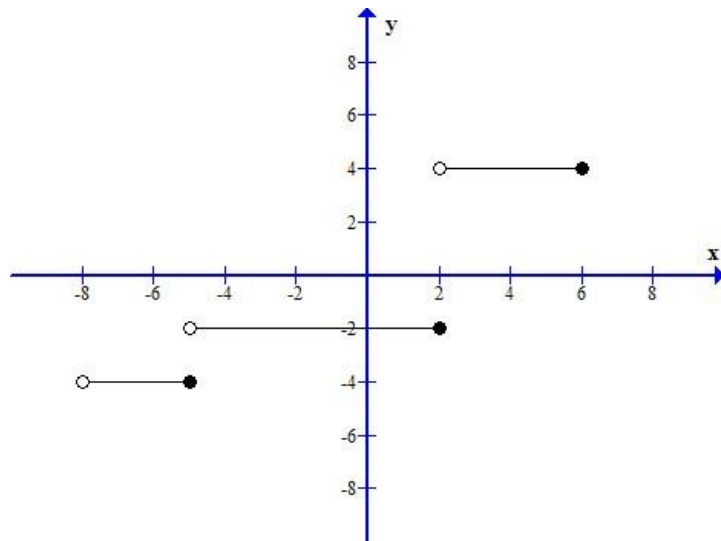
$$f(x) = \begin{cases} 5 - 3x, & x \neq 4 \\ 4, & x = 4 \end{cases}$$



18)  $\lim_{x \rightarrow 1} f(x) =$

19)  $\lim_{x \rightarrow 4} f(x) =$

20)  $f(4) =$



$$21) \lim_{x \rightarrow 2^+} f(x) =$$

$$22) \lim_{x \rightarrow 2^-} f(x) =$$

$$23) \lim_{x \rightarrow 2} f(x) =$$

$$24) \lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x - 3}$$

$$25) \lim_{x \rightarrow 0} \frac{\sqrt{x+9} - 3}{x}$$

$$26) \lim_{x \rightarrow 2} \frac{x^2 - 5x - 6}{x + 1}$$

$$27) \lim_{x \rightarrow -3} (-2x^2 + 1)$$

$$28) \quad \lim_{\theta \rightarrow \pi/2} \cot^2 \theta$$

$$29) \quad \lim_{x \rightarrow -1} \frac{x^2 - 5x - 6}{x + 1}$$

$$30) \quad \lim_{x \rightarrow 5} \csc\left(\frac{\pi x}{4}\right)$$

$$31) \quad \lim_{x \rightarrow 0} \frac{1 - \cos^2 x}{x}$$

$$32) \quad \lim_{x \rightarrow 0} \frac{2 \sec x - 2}{x \sec x}$$

$$33) \quad \lim_{x \rightarrow 0} \frac{\sin^2 x}{6x}$$

$$34) \quad \lim_{x \rightarrow 0} \frac{\frac{1}{x+3} - \frac{1}{3}}{6x}$$

$$35) \quad \text{If } \lim_{x \rightarrow c} f(x) = -5 \text{ and } \lim_{x \rightarrow c} g(x) = 2, \text{ what does } \lim_{x \rightarrow c} [g(x) - f(x)]$$

$$36) \quad \lim_{\theta \rightarrow 0} \frac{2 \cos \theta \tan \theta}{3\theta}$$

$$37) \quad \lim_{\theta \rightarrow 0} \frac{2 \cos \theta}{3 \cot \theta}$$

38)  $\lim_{x \rightarrow 3} \sqrt{x^2 - 4}$

39) Use the definition of the derivative to find the derivative of  $f(x) = 6 - 5x$ .

40) Use the definition of the derivative to find the derivative of  $f(x) = 9$ .

41) Use the definition of the derivative to find the derivative of  $f(x) = 3x^2 - 8$ .

42) What is the slope of the line tangent to  $f(x) = 3x^2 - 8$  at the point  $(-2, 4)$ ?

43) Find the derivative of  $f(x) = \frac{1}{5-x}$ .

44) Find the derivative of  $f(x) = \sqrt{x} - 11$ .

45) What is the equation of the line tangent to  $f(x) = \sqrt{x} - 11$  at the point  $(20, 3)$ ?

46) Find the derivative of  $f(x) = x^3 - 8x + 2$ .

47) What is the equation of the line tangent to  $f(x) = x^3 - 8x + 2$  at the point  $(-1, 9)$ ?

48) Find the derivative of  $f(x) = \frac{1}{x^2}$ .

49) Find the tangent line of the function  $f(x) = x^2 + \frac{1}{x}$  at the point  $(1, 2)$ .

50) Find the value of the derivative of  $f(x) = x^3 + 2x^2 + 1$  at the given point  $(-2, 1)$

51) Find the derivative of  $f(x) = 4x^4 - 3x^2 - 2x$

52) Find the derivative of  $f(x) = x^4 \left( 1 - \frac{2}{x+1} \right)$

53) Find the derivative  $f(x) = \sin x (\sin x + \cos x)$

54) Find the derivative  $f(x) = \frac{1}{x} - 10 \csc x$

55) Find the derivative  $f(x) = \sqrt{\frac{x+1}{x}}$

56) Find the derivative  $f(x) = x(3x - 9)^3$

57) Find the derivative  $f(x) = \sin(\cos x)$

58) Find the derivative  $f(x) = \sin\sqrt{x} + \sqrt{\sin x}$

59) Find  $dy/dx$  of  $(xy)^3 - y = x$

60) Find  $dy/dx$  of  $\tan(x + y) = x$

61) Find  $\frac{dy}{dx}$  of  $x^3 + y^3 = 2xy$  and find the value of the derivative at the point (1, 1)

62) Find  $\frac{dy}{dx}$  of  $y = 4 \sin x - 5 \cos y + x$

63) Find  $\frac{dy}{dx}$  of  $x \sin y = y \cos x$

64) Find  $\frac{dy}{dx}$  of  $x^2 + 9y^2 - 4x + 3y = 0$

65) Find  $\frac{dy}{dx}$  of  $x^2 + 3xy + y^3 = 10$

66) Suppose the position equation for a moving object is given by  $s(t) = 3t^2 - 2t + 5$  where  $s$  is measured in meters and  $t$  is measured in seconds. Find the velocity of the object when  $t=2$ .

67) Find the point(s) on the graph of the function  $f(x) = x^3 - 2$  where the slope is 3.

68) A particle moves along the curve given by  $y = \sqrt{t^3 + 1}$ . Find the acceleration when  $t = 2$  seconds.

69) Find the second derivative of  $\frac{x + 2}{x - 3}$

70) Find the second derivative of  $\sin^3 4x$

71) Find all critical numbers for the function  $f(x) = (9 - x^2)^{3/5}$

72) Find the extrema and the intervals where the function is increasing or decreasing of

$$y = \frac{2x}{(x + 4)^3}$$

73) Find the extrema of  $y = \sin x + \cos x$  in the interval  $[0, 2\pi]$

74) A circle is decreasing in size at the rate of 5 square inches per minute. At what rate is the radius decreasing when the radius is 4?

75) A cylindrical water storage container is leaking at a rate of  $.4 \text{ m}^3/\text{min}$ . If the container has a radius of 2 m, at what rate is the height of the water changing when the water level is 4.2 m?