

### Assignment 1-4

Use the limit definition of the derivative to find  $f'(x)$  or  $f'(t)$ . Show correct limit symbolism.

1.  $f(x) = -3x$     2.  $f(x) = x^2 - 1$     3.  $f(x) = \frac{1}{x-1}$     4.  $f(t) = t^3 - 12t$     5.  $f(x) = 3$

Use the alternate form of the limit definition of the derivative to find the indicated derivative.

6.  $f(x) = x^2 - 1$  Find  $f'(2)$ .    7.  $f(x) = x^3 - 2x^2 - 1$  Find  $f'(2)$ .

8.  $f(x) = \frac{1}{x}$  Find  $f'(3)$ .    9.  $f(x) = (x-1)^{\frac{2}{3}}$  Find  $f'(1)$ .

10. If  $y = x^2 - x$ , use the limit definition of the derivative to find  $y'$ .

11. If  $y = x^3 + 1$ , use the limit definition of the derivative to find  $\frac{dy}{dx}$ .

12. If  $f(x) = 2x^2 + 4$ , use the limit definition of the derivative to find  $f'(x)$ . Then find  $f'(4)$ .

13. If  $f(x) = 2x^2 + 4$ , use the alternate form of the limit definition of the derivative to find  $f'(4)$ .

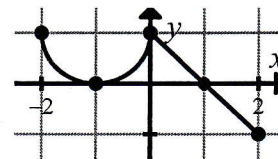
For Problems 14-17, solve for  $\theta$ , where  $0 \leq \theta < 2\pi$ , without using a calculator.

14.  $\sec^2 \theta - 4 = 0$     15.  $\sin^2 \theta = \cos^2 \theta$     16.  $\tan \theta - \sin \theta = 0$     17.  $2\sin^2 \theta = \cos \theta + 1$

18. Use a calculator to solve for  $x$  on the interval  $[0, 2\pi)$  for  $\tan x = \csc^2 x - 2$ .

Use the graph of  $y = f(x)$  shown to graph the following.

19.  $y = |f(x)|$     20.  $y = f(x-2) + 1$     21.  $y = -2f(x)$



22. Find the domain, vertical asymptotes, holes, intercepts, end behavior, and graph for the function  $y = \frac{x(x-1)}{x^2-1}$ .

Use the graph of  $y = f(x)$  for Problems 23-32.

Find the following limits and function values.

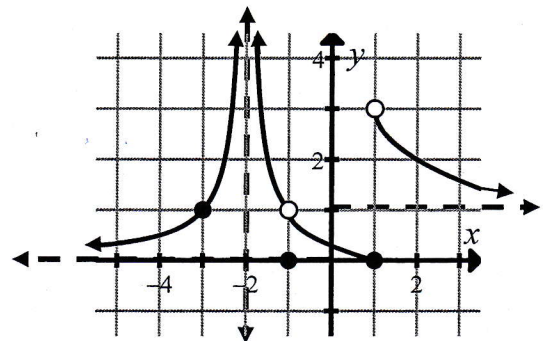
23.  $\lim_{x \rightarrow -1} f(x)$     24.  $f(-1)$     25.  $\lim_{x \rightarrow 1} f(x)$

26.  $\lim_{x \rightarrow 1^+} f(x)$     27.  $\lim_{x \rightarrow -3} f(x)$     28.  $\lim_{x \rightarrow \infty} f(x)$

29.  $\lim_{x \rightarrow -\infty} f(x)$     30.  $\lim_{x \rightarrow -2} f(x)$

31. List all removable discontinuities of  $f(x)$ .

32. List all nonremovable discontinuities of  $f(x)$ .



Find the following limits without using a calculator.

33.  $\lim_{x \rightarrow 2} (5x - 3)$     34.  $\lim_{x \rightarrow 3} \frac{x^2 - 9}{3 - x}$     35.  $\lim_{t \rightarrow -3} \frac{3 + t}{t^2 - 9}$     36.  $\lim_{t \rightarrow 2} \frac{t^2 - 4}{t^2 - 3t + 2}$     37.  $\lim_{x \rightarrow 0^+} \left( x + \frac{1}{x^3} \right)$
38.  $\lim_{x \rightarrow \frac{1}{2}} \frac{4x - 2}{2x - 1}$     39.  $\lim_{x \rightarrow 1} \frac{x - 1}{x^4 - 1}$     40.  $\lim_{x \rightarrow 1} \frac{x^2 - 2x + 1}{x + 1}$     41.  $\lim_{x \rightarrow 1} \frac{x^2 - 2x + 1}{x - 1}$     42.  $\lim_{x \rightarrow 2} \frac{3x + 5}{\tan \frac{\pi x}{4}}$

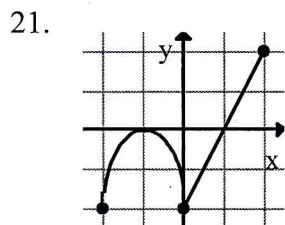
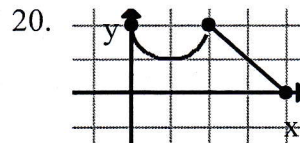
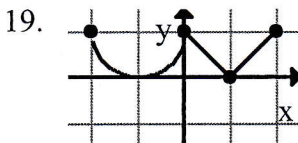
**Selected Answers:**

1.  $f'(x) = -3$     2.  $f'(x) = 2x$     3.  $f'(x) = -\frac{1}{(x-1)^2}$     4.  $f'(t) = 3t^2 - 12$     5.  $f'(x) = 0$

6.  $f'(2) = 4$     7.  $f'(2) = 4$     8.  $f'(3) = -\frac{1}{9}$     9.  $f'(1)$  is undefined    10.  $y' = 2x - 1$

11.  $\frac{dy}{dx} = 3x^2$     12.  $f'(x) = 4x$ ,  $f'(4) = 16$     13.  $f'(4) = 16$     15.  $\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

16.  $\theta = 0, \pi$     17.  $\theta = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$



22. Do:  $x \neq \pm 1$

$y_{red} = \frac{x}{x+1}$

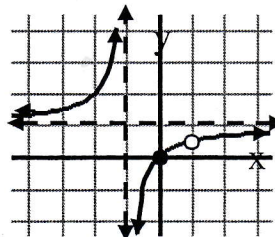
Hole:  $\left(1, \frac{1}{2}\right)$

EB: HA  $y = 1$

VA:  $x = -1$  (odd)

x-int:  $(0, 0)$  (odd)

y-int:  $(0, 0)$



23. 1    24. 0    25. DNE    26. 3    27. 1    28. 1    29. 0    30.  $\infty$  or DNE    31.  $x = -1$

32.  $x = -2, 1$     33. 7    34. -6    35.  $-\frac{1}{6}$     36. 4    37.  $\infty$  or DNE    38. 2    39.  $\frac{1}{4}$

40. 0    41. 0    42. 0