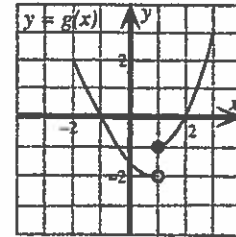
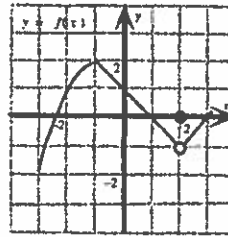


Use the graphs to find each limit, if it exists.

- | | |
|---|---|
| 1. $\lim_{x \rightarrow 2} (f(x) + g(x))$ | 2. $\lim_{x \rightarrow -1} \frac{f(x)}{g(x)}$ |
| 3. $\lim_{x \rightarrow 1} \sqrt{3 + f(x)}$ | 4. $\lim_{x \rightarrow 2} x^3 f(x)$ |
| 5. $\lim_{x \rightarrow 1^-} g(x)$ | 6. $\lim_{x \rightarrow 2^+} \frac{f(x)}{g(x)}$ |
| 7. $\lim_{x \rightarrow 2} f(g(x))$ | 8. $\lim_{x \rightarrow -1} (2f(x)g(x))$ |



9. Find the value(s) of x for which $h(x) = \frac{2x+1}{2x^2+11x+5}$ is discontinuous and identify these discontinuities as removable or nonremovable.
10. Draw a function with each of the following characteristics:
- | | |
|------------------------|------------------------------|
| a) point discontinuity | b) infinite discontinuity |
| c) jump discontinuity | d) oscillating discontinuity |
11. Write the definition of continuity at a point.

Find each limit, if it exists.

- | | | | |
|---|--|---|--|
| 12. $\lim_{x \rightarrow 0} \frac{\sin 3x}{x}$ | 13. $\lim_{x \rightarrow 2} \sec \frac{\pi x}{3}$ | 14. $\lim_{x \rightarrow 0} \frac{x + \sin x}{x}$ | 15. $\lim_{x \rightarrow 3} \sqrt{9 - x^2}$ |
| 16. $\lim_{x \rightarrow \infty} \frac{2x}{\sqrt{x^2 + 1}}$ | 17. $\lim_{x \rightarrow 2} \frac{x^3 - 1}{x - 2}$ | 18. $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 + 4}$ | 19. $\lim_{h \rightarrow 0} \frac{(3+h)^2 - 9}{h}$ |
| 20. $\lim_{x \rightarrow 1} \left(5 - \frac{2}{(x-1)^2} \right)$ | 21. $\lim_{x \rightarrow 0} \frac{1}{2+x} - \frac{1}{2}$ | 22. $\lim_{x \rightarrow 0} f(x)$, if $f(x) = \begin{cases} x , & x \neq 0 \\ 0, & x = 0 \end{cases}$ | |
| 23. $\lim_{x \rightarrow -2} (x-6)^{2/3}$ | 24. $\lim_{x \rightarrow \pi^-} \frac{\sin x}{1 - \cos x}$ | 25. $\lim_{x \rightarrow -\infty} \frac{5x^3 - 2x + 7}{3x^3 + 2x^2}$ | |

For the next three questions, use $f(x) = \begin{cases} 3-x, & x < 2 \\ \frac{x}{2} + 1, & x > 2 \end{cases}$.

- | | | |
|-------------------------------------|-------------------------------------|-----------------------------------|
| 26. $\lim_{x \rightarrow 2^+} f(x)$ | 27. $\lim_{x \rightarrow 2^-} f(x)$ | 28. $\lim_{x \rightarrow 2} f(x)$ |
|-------------------------------------|-------------------------------------|-----------------------------------|

For the next three questions, use $f(x) = \begin{cases} 3-x, & x < 2 \\ 2, & x = 2. \\ \frac{x}{2}, & x > 2 \end{cases}$

29. $\lim_{x \rightarrow 2^+} f(x)$

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

31. $\lim_{x \rightarrow 2} f(x)$

For the next three questions, let $f(x) = \frac{x^2 - 3x - 10}{x^2 - 4}$.

32. Find $\lim_{x \rightarrow -2} f(x)$, if it exists.

33. Sketch a graph of $f(x)$.

34. Find a new function, $g(x)$, that agrees with $f(x)$ at all but one point and is defined at $x = -2$.

35. Determine the value of c such that each function is continuous on $(-\infty, \infty)$.

a) $f(x) = \begin{cases} 3x-2, & x < 5 \\ x^2+c, & x \geq 5 \end{cases}$

b) $g(x) = \begin{cases} x^2-1, & x < 3 \\ 2cx, & x \geq 3 \end{cases}$

36. Find all vertical and horizontal asymptotes of each function.

a) $g(x) = \frac{x-2}{2x^2+3x-5}$ b) $f(x) = \frac{x^2-2x}{x+2}$ c) $h(x) = \frac{x^2-4}{x^2+4}$

37. In your own words, explain the Intermediate Value Theorem. Include a sketch with your answer.

38. Identify all asymptotes and discontinuities of the graph of $y = \frac{3x^2 - x + 5}{x^2 - 4}$.

For the next three questions, let $f(x) = \begin{cases} \frac{x^2+x}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$.

True or false. Justify your answers.

39. $\lim_{x \rightarrow 0} f(x)$ exists.

40. $f(0)$ exists.

41. f is continuous at $x = 0$.

42. Let $g(x) = 4x^2 - x$.

a) Find the average rate of change of g on $[0, 5]$.

b) Find the rate of change of g at $x = 2$.

c) Find the equation of the tangent line at $x = 2$.

d) Find the equation of the normal line at $x = 2$.