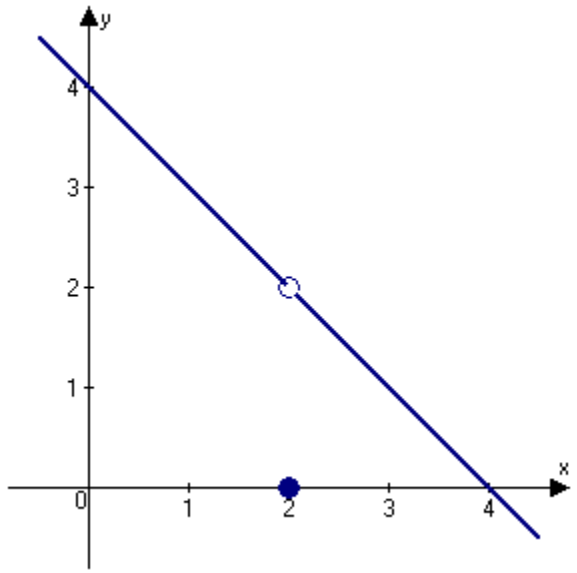
Name: _____ Date: _____

1. Let

$$f(x)=\begin{cases}4-x, & x\neq 2\\ 0 & x=2\end{cases}.$$

Determine the following limit. (Hint: Use the graph of the function.)

$$\lim_{x\to 2} f(x)$$

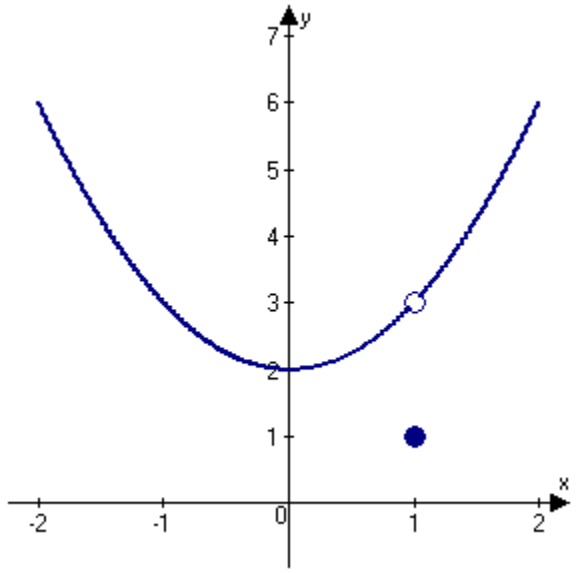


2. Let

$$f(x)=\begin{cases} x^2+2, & x\neq 1 \\ 1, & x=1 \end{cases}.$$

Determine the following limit. (Hint: Use the graph of the function.)

$\lim_{x\to 1} f(x)$



3. Let $f(x)=4x+3$ and $g(x)=x^3$. Find the limits:

(a) $\lim_{x\to 3} f(x)$ (b) $\lim_{x\to 5} g(x)$ (c) $\lim_{x\to 5} g(f(x))$

4. Let $f(x)=x^2-3$ and $g(x)=2x$. Find the limits:

(a) $\lim_{x\to -1} f(x)$ (b) $\lim_{x\to -3} g(x)$ (c) $\lim_{x\to -4} g(f(x))$

5. Let $f(x)=3+x^2$ and $g(x)=\sqrt{x+2}$. Find the limits:

(a) $\lim_{x\to 3} f(x)$ (b) $\lim_{x\to 3} g(x)$ (c) $\lim_{x\to 3} g(f(x))$

6. Let $f(x)=4x^2-5x-4$ and $g(x)=\sqrt[3]{x-5}$. Find the limits:

(a) $\lim_{x\to 5} f(x)$ (b) $\lim_{x\to 1} g(x)$ (c) $\lim_{x\to 2} g(f(x))$

7. Find the limit:

$$\lim_{x\to\frac{5\pi}{6}} \sin x$$

8. Find the limit:

$$\lim_{x\to 2} \cos\left(\frac{\pi x}{3}\right)$$

9. Find the limit:

$$\lim_{x\to \pi} \tan\left(\frac{x}{6}\right)$$

10. Suppose that $\lim_{x\to c} f(x) = 7$ and $\lim_{x\to c} g(x) = 6$. Find the following limit:

$$\lim_{x\to c}\left[f(x)^{g(x)} \right]$$

11. Suppose that $\lim_{x\to c} f(x) = 15$ and $\lim_{x\to c} g(x) = -7$. Find the following limit:

$$\lim_{x\to c}\left[f(x) + g(x) \right]$$

12. Suppose that $\lim_{x\to c} f(x) = -12$ and $\lim_{x\to c} g(x) = -8$. Find the following limit:

$$\lim_{x\to c}\left[f(x) - g(x) \right]$$

13. Suppose that $\lim_{x\to c} f(x) = -8$ and $\lim_{x\to c} g(x) = 4$. Find the following limit:

$$\lim_{x\to c}\left[-9\,g(x) \right]$$

14. Suppose that $\lim_{x\to c} f(x) = 6$ and $\lim_{x\to c} g(x) = -2$. Find the following limit:

$$\lim_{x\to c}\left[f(x)g(x) \right]$$

15. Suppose that $\lim_{x\to c} f(x) = 11$ and $\lim_{x\to c} g(x) = -9$. Find the following limit:

$$\lim_{x\to c} \frac{f(x)}{g(x)}$$

16. Find the following limit (if it exists). Write a simpler function that agrees with the given function at all but one point.

$$\lim_{x\to -6}\frac{x^3+216}{x+6}$$

17. Find the following limit (if it exists). Write a simpler function that agrees with the given function at all but one point.

$$\lim_{x\to 1}\frac{-3x^2+14x-11}{x-1}$$

18. Find the limit (if it exists):

$$\lim_{x\to -4}\frac{x+4}{x^2-16}$$

19. Find the limit (if it exists):

$$\lim_{\Delta x\to 0}\frac{\left(x+\Delta x\right)^2+\left(x+\Delta x\right)+1-\left(x^2+x+1\right)}{\Delta x}$$

20. Determine the limit (if it exists):

$$\lim_{x\to 0}\frac{\sin x\left(1-\cos x\right)}{3x^6}$$

21. Determine the limit (if it exists):

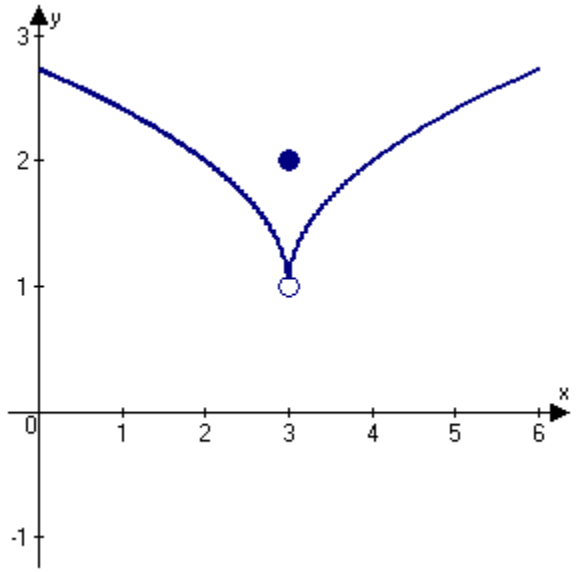
$$\lim_{x\to 0}\frac{-2\left(1-\cos x\right)}{x^2}$$

22. Determine the limit (if it exists):

$$\lim_{x\to 0}\frac{\sin^6 x}{x^6}$$

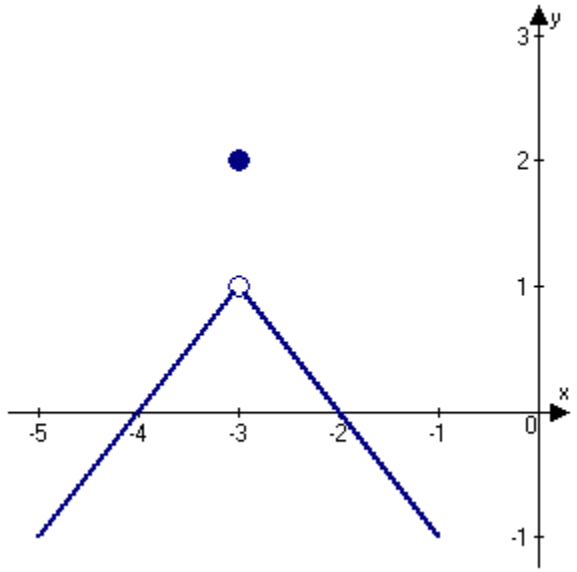
23. Use the graph as shown to determine the following limits, and discuss the continuity of the function at $x = 3$.

(i) $\lim_{x \to 3^+} f(x)$ (ii) $\lim_{x \to 3^-} f(x)$ (iii) $\lim_{x \to 3} f(x)$



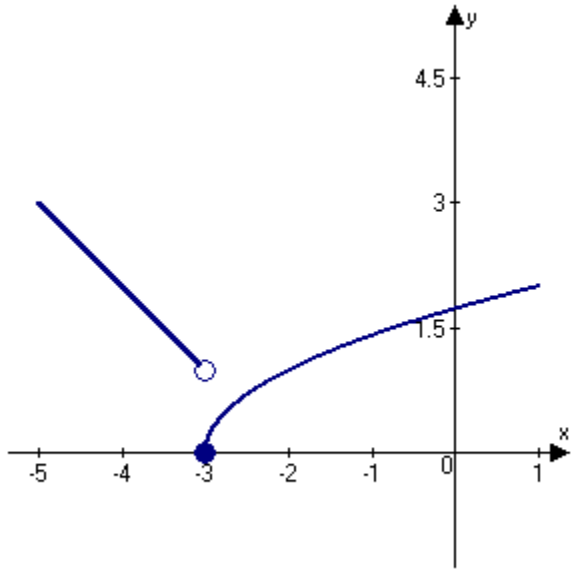
24. Use the graph as shown to determine the following limits, and discuss the continuity of the function at $x = -3$.

(i) $\lim_{x \to -3^+} f(x)$ (ii) $\lim_{x \to -3^-} f(x)$ (iii) $\lim_{x \to -3} f(x)$



25. Use the graph to determine the following limits, and discuss the continuity of the function at $x = -3$.

(i) $\lim_{x \to -3^+} f(x)$ (ii) $\lim_{x \to -3^-} f(x)$ (iii) $\lim_{x \to -3} f(x)$



26. Find the *x*-values (if any) at which the function $f(x) = -14x^2 - 14x - 9$ is not continuous. Which of the discontinuitites are removable?

27. Find the *x*-values (if any) at which the function $f(x) = \dfrac{x}{x^2 - 49}$ is not continuous. Which of the discontinuitites are removable?

28. Find the *x*-values (if any) at which the function $f(x) = \dfrac{x-3}{x^2 - 9x + 18}$ is not continuous. Which of the discontinuitites are removable?

29. Find constants *a* and *b* such that the function

$$f(x) = \begin{cases} 8, & x \le -7 \\ ax + b, & -7 < x < 9 \\ -8, & x \ge 9 \end{cases}$$

is continuous on the entire real line.

30. Find the constant a such that the function

$$f(x)=\begin{cases}-7\cdot\dfrac{\sin x}{x}, & x<0\\ a+9x, & x\geq 0\end{cases}$$

is continuous on the entire real line.

31. Find the vertical asymptotes (if any) of the function $f(x)=\dfrac{x^2-100}{x^2+4x-60}$.

32. Find the vertical asymptotes (if any) of the function $f(x)=\dfrac{x^2+4x+3}{x^3-7x^2+7x+15}$.

33. Find the vertical asymptotes (if any) of the function $f(x)=\tan(-15x)$.

34. Find the limit:

$$\lim_{x\to 7^+}\frac{x+10}{x-7}$$

35. Find the limit:

$$\lim_{x\to 12}\frac{x^2-12x}{\left(x^2+144\right)\left(x-12\right)}$$

36. Find the limit:

$$\lim_{x\to 0^-}\left(x^9+\frac{1}{x}\right)$$