

Problem 1 - 4, Find $\lim_{x \rightarrow \infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$, then identify all horizontal or slant asymptotes.

$$1. f(x) = \frac{7 + 2x - 5x^2}{2x^2 - 7x - 4}$$

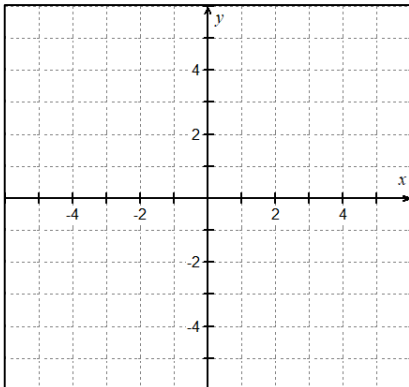
$$2. f(x) = \frac{2x - 3}{\sqrt{4x^2 + 3}}$$

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

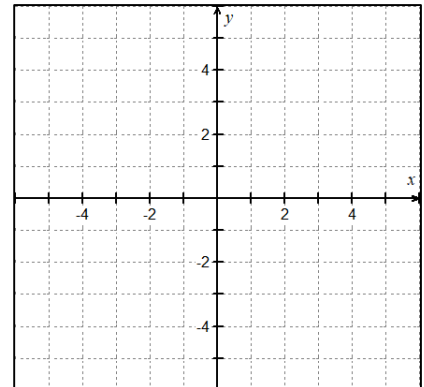
$$4. f(x) = \frac{x^{4/3} + x^{1/3}}{(4x^{2/3} + 1)^2}$$

Problems 5 - 6, sketch a function that satisfies the stated conditions. Include asymptotes.

$$5. \begin{array}{ll} \lim_{x \rightarrow 3} f(x) = -2 & \lim_{x \rightarrow -2^-} f(x) = -\infty \\ \lim_{x \rightarrow -2^+} f(x) = +\infty & \lim_{x \rightarrow -\infty} f(x) = 3 \\ \lim_{x \rightarrow +\infty} f(x) = \infty & \end{array}$$



$$6. \begin{array}{ll} \lim_{x \rightarrow -3^-} f(x) = +\infty & \lim_{x \rightarrow -3^+} f(x) = +\infty \\ \lim_{x \rightarrow 2} f(x) = 3 & \lim_{x \rightarrow -\infty} f(x) = -3 \\ \lim_{x \rightarrow +\infty} f(x) = -3 & \end{array}$$



Problems 7 - 10, Identify all vertical asymptotes and find $\lim_{x \rightarrow a^+} f(x)$; $\lim_{x \rightarrow a^-} f(x)$ and $\lim_{x \rightarrow a} f(x)$, where a is the x -value of the asymptote.

7. $f(x) = \frac{x + 4}{x^2 + 9x + 20}$

8. $f(x) = \frac{2x^2 - x - 15}{x^2 - 5x + 6}$

9. $f(x) = \frac{\ln(x^2 + 1)}{x + 1}$

10. $f(x) = \frac{x^2 + 3x - 18}{x^2 - 6x + 9}$

Problems 11 - 12, For the piecewise functions, find the limit as $x \rightarrow \infty$, $x \rightarrow -\infty$, $x \rightarrow 0^-$, and $x \rightarrow 0^+$.

11. $f(x) = \begin{cases} \frac{2x + 3}{x - 1}, & x < 0 \\ \frac{1}{x}, & x \geq 0 \end{cases}$

12. $g(x) = \begin{cases} \frac{1}{x^2}, & x < 0 \\ \frac{2x}{x + 1}, & x \geq 0 \end{cases}$

Problems 13 - 20, Evaluate the following limits without the aid of a calculator.

13. $\lim_{x \rightarrow \infty} \left[\left(\frac{3x^2 - 1}{x^2} \right) \left(\frac{2}{x} - 1 \right) \right]$

14. $\lim_{x \rightarrow -\infty} \left(\frac{5 + 4x - 3x^2}{2x^2 + 1} \right)$

15. $\lim_{x \rightarrow \infty} (e^{-x} \sin x)$

16. $\lim_{x \rightarrow 3^+} \ln(x^2 - 9)$

17. $\lim_{x \rightarrow -1^-} \frac{x+1}{x^4-1}$

18. $\lim_{x \rightarrow 0^-} \frac{2^x}{x}$

19. $\lim_{x \rightarrow \infty} \frac{x^2 + 3x}{\sqrt{2x^2 + 1}}$

20. $\lim_{x \rightarrow \infty} \frac{4x + 9}{2x^2 - x + 6}$

Problems 21 - 26, Use the graph of $y = g(x)$ at right to find the limits.

21. $\lim_{x \rightarrow -3^-} g(x) =$

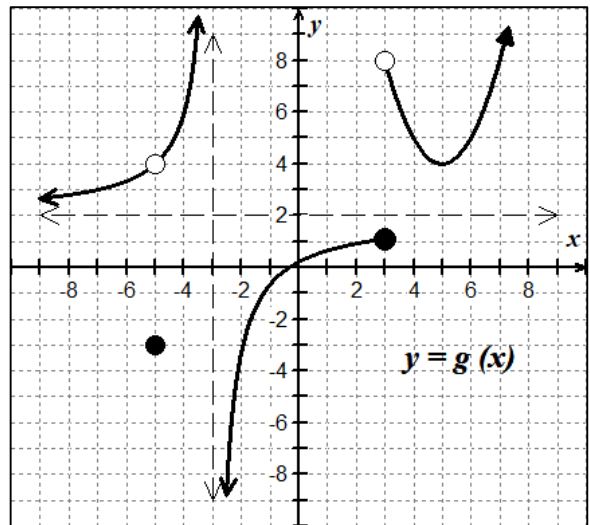
22. $\lim_{x \rightarrow -3^+} g(x) =$

23. $\lim_{x \rightarrow -3} g(x) =$

24. $\lim_{x \rightarrow -\infty} g(x) =$

25. $\lim_{x \rightarrow \infty} g(x) =$

26. $\lim_{x \rightarrow 3^+} g(x) =$



Problems 27 - 29, Multiple Choice.

_____ 27. Find the limit: $\lim_{x \rightarrow -\infty} \frac{4+e^{-x}}{1-e^{-x}}$

- (A) 4 (B) -4 (C) -1 (D) $-\infty$

_____ 28. Find the limit: $\lim_{x \rightarrow 3} \left(2 - \frac{5}{(x-3)^2} \right)$

- (A) ∞ (B) $-\infty$ (C) 2 (D) -3

_____ 29. $f(x)$ decreases without bound as x approaches what value from the right?

$$f(x) = \frac{6}{(x-3)(7-x)}$$

- (A) -7 (B) 7 (C) -3 (D) 3