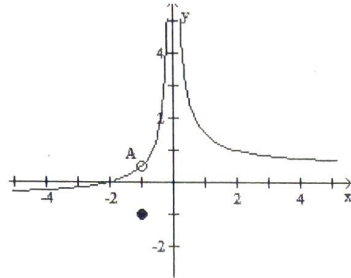


Drill_Limits and Asymptotes

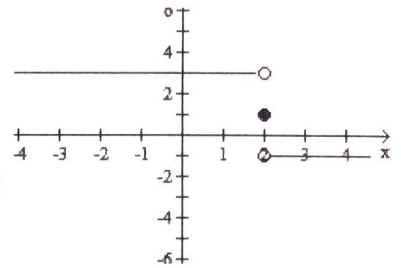
Key

Use the graph of $f(x)$ to evaluate the limits.

1.
 - a. $\lim_{x \rightarrow -1} f(x) = \frac{1}{2}$
 - b. $\lim_{x \rightarrow 0} f(x) = \infty$
 - c. $\lim_{x \rightarrow \infty} f(x) = 0$
 - d. $f(-1) = -1$
 - e. $\lim_{x \rightarrow -2} f(x) = 0$



2.
 - a. $\lim_{x \rightarrow 2^+} f(x) = -1$
 - b. $\lim_{x \rightarrow 2^-} f(x) = 3$
 - c. $\lim_{x \rightarrow 2} f(x) = \text{DNE}$
 - d. $\lim_{x \rightarrow -\infty} f(x) = 3$
 - e. $f(2) = 1$



3. Use the table to estimate the $\lim_{x \rightarrow 4} f(x) = \boxed{4}$

x	3.9	3.99	3.999	4.001	4.01	4.1
f(x)	3.97484	3.99750	3.99975	4.00025	4.00250	4.02485

Evaluate the limit analytically.

4. $\lim_{x \rightarrow 10} \frac{x-3}{x-10}$ **DNE**
 $x=9.9$ | $x=10.1$
 $\frac{9.9-3}{9.9-10} = \frac{6.9}{-0.1} = -69$ | $\frac{10.1-3}{10.1-10} = \frac{7.1}{0.1} = 71$
 is a vertical asymptote.

5. $\lim_{x \rightarrow 2} \frac{x+3}{x-10}$
 $\frac{2+3}{2-10} = \frac{5}{-8} = \boxed{-\frac{5}{8}}$

6. $\lim_{x \rightarrow -4} \frac{x+4}{x^2-16} = \frac{0}{0}$

$\lim_{x \rightarrow -4} \frac{x+4}{(x+4)(x-4)} = \lim_{x \rightarrow -4} \frac{1}{x-4} = \frac{1}{-4-4} = \boxed{-\frac{1}{8}}$

7. $\lim_{x \rightarrow 25} \frac{\sqrt{x}-5}{x-25}$
 $\lim_{x \rightarrow 25} \frac{\sqrt{x}-5}{x-25} \cdot \frac{\sqrt{x}+5}{\sqrt{x}+5} = \lim_{x \rightarrow 25} \frac{1}{\sqrt{x}+5} = \frac{1}{10} = \boxed{\frac{1}{10}}$

8. $\lim_{x \rightarrow -6} \frac{x^2+6x}{x^2+x-30}$

$\lim_{x \rightarrow -6} \frac{x(x+6)}{(x+6)(x-5)} = \lim_{x \rightarrow -6} \frac{x}{x-5} = \frac{-6}{-6-5} = \frac{-6}{-11} = \boxed{\frac{6}{11}}$

9. $\lim_{x \rightarrow \infty} 12 = \boxed{12}$

10. $\lim_{x \rightarrow -\infty} \frac{7x^2-3}{x-10} = \boxed{-\infty}$
 $\frac{7x^2}{x} = \lim_{x \rightarrow -\infty} 7x = -\infty$

11. $\lim_{x \rightarrow -\infty} \frac{12x^2-4x+3}{x^5-3x^2+8x}$

$\lim_{x \rightarrow -\infty} \frac{12x^2}{x^5} = \lim_{x \rightarrow -\infty} \frac{12}{x^3} = \boxed{0}$
 $\lim_{x \rightarrow \infty} \frac{15}{3} = \boxed{5}$

12. $\lim_{x \rightarrow \infty} \frac{15x^4-2x^2+9}{3x^4+2x^3-7x} = \boxed{5}$

Write an equation for each vertical and horizontal asymptote for given function.

13. $f(x) = \frac{3x+5}{x-2}$

Vertical:
 $x-2=0$
 $\boxed{x=2}$

Horizontal:
 $\lim_{x \rightarrow \infty} \frac{3x+5}{x-2} = 3$
 $\boxed{y=3}$

14. $f(x) = \frac{x-5}{x^2-25} = \frac{x-5}{(x+5)(x-5)}$

Vertical:
 $x+5=0$
 $\boxed{x=-5}$

Horizontal:
 $\lim_{x \rightarrow \infty} \frac{1}{x} = 0$
 $\boxed{y=0}$