

Section 2.2 : 1-31 odd, 35-38, 39, 41, 43

1. a) 1
 b) 1
 c) $y=1$

3. a) 0
 b) $-\infty$
 c) $y=0$

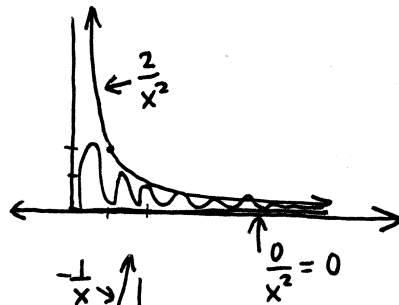
5. a) 3
 b) -3
 c) $y=3, y=-3$

7. a) 1
 b) -1
 c) $y=1, y=-1$

9. $\lim_{x \rightarrow \infty} \frac{1 - \overbrace{\cos x}^{[-1,1]}}{x^2}$ $1-1=0 \leftarrow$ least possible numerator
 $1-(-1)=2 \leftarrow$ greatest possible numerator

$$\frac{0}{x^2} \leq \frac{1 - \cos x}{x^2} \leq \frac{2}{x^2}$$

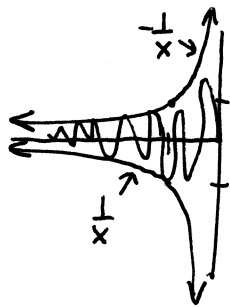
0



$$\lim_{x \rightarrow \infty} \frac{1 - \cos x}{x^2} = \boxed{0}$$

11. $\lim_{x \rightarrow -\infty} \frac{\overbrace{\sin x}^{[-1,1]}}{x}$

$$-\frac{1}{x} \leq \frac{\sin x}{x} \leq \frac{1}{x}$$



$$\lim_{x \rightarrow -\infty} \frac{\sin x}{x} = \boxed{0}$$

13. ∞

15. $-\infty$

17. 0

19. ∞

$$21. \lim_{x \rightarrow \infty} y = \left(2 - \frac{\infty}{\infty+1}\right) \left(\frac{\infty^2}{5+\infty^2}\right) = (2-1)(1) = 1 \cdot 1 = \boxed{1}$$

$$\lim_{x \rightarrow -\infty} y = \left(2 - \frac{-\infty}{-\infty+1}\right) \left(\frac{(-\infty)^2}{5+(-\infty)^2}\right) = (2-1)(1) = 1 \cdot 1 = \boxed{1}$$

$$23. \lim_{x \rightarrow \infty} y = \frac{\cos(1/\infty)}{1 + \frac{1}{\infty}} = \frac{\cos 0}{1+0} = \frac{1}{1} = \boxed{1}$$

$$\lim_{x \rightarrow -\infty} y = \frac{\cos(1/-\infty)}{1 + \frac{1}{-\infty}} = \frac{\cos 0}{1+0} = \frac{1}{1} = \boxed{1}$$

$$25. \lim_{x \rightarrow \infty} y = \frac{\sin \infty}{2\infty^2 + \infty} = \frac{\pm 1}{\infty} = \boxed{0}$$

$$\lim_{x \rightarrow -\infty} y = \frac{\sin(-\infty)}{2(-\infty)^2 - \infty} = \frac{\pm 1}{\infty} = \boxed{0}$$

$$27. f(x) = \frac{1}{x^2 - 4}$$

$$a) x^2 - 4 = 0 \rightarrow x = 2, x = -2$$

$$b) \lim_{x \rightarrow 2^+} f(x) = \infty$$

$$\lim_{x \rightarrow 2^+} f(x) = -\infty$$

$$\lim_{x \rightarrow 2^-} f(x) = -\infty$$

$$\lim_{x \rightarrow 2^-} f(x) = \infty$$

$$29. f(x) = \frac{x^2 - 2x}{x+1}$$

$$a) x+1 = 0 \rightarrow x = -1$$

$$b) \lim_{x \rightarrow -1^+} f(x) = \infty$$

$$\lim_{x \rightarrow -1^-} f(x) = -\infty$$

$$31. f(x) = \cot x$$

$$a) x = 0, \pi, 2\pi, -\pi, -2\pi, \dots \rightarrow x = k\pi, k \in \mathbb{Z}$$

$$\lim_{x \rightarrow 0^+} f(x) = \infty$$

$$\lim_{x \rightarrow 0^-} f(x) = -\infty$$

$$35. \frac{2x^3}{x} = 2x^2 \rightarrow \boxed{A}$$

$$36. \frac{x^5}{2x^2} = \frac{1}{2}x^3 \rightarrow \boxed{C}$$

$$37. \frac{2x^4}{-x} = -2x^3 \rightarrow \boxed{D}$$

$$38. \frac{x^4}{-x^2} = -x^2 \rightarrow \boxed{B}$$

$$39. \boxed{3x^2}, \lim_{x \rightarrow \infty} 3x^2 = \infty \rightarrow \boxed{\text{no HA}}$$

$$41. \frac{x}{2x^2} = \boxed{\frac{1}{2x}}, \lim_{x \rightarrow \infty} \frac{1}{2x} = \frac{1}{\infty} = 0 \rightarrow \boxed{y=0}$$

$$43. \frac{4x^3}{x} = \boxed{4x^2}, \lim_{x \rightarrow \infty} 4x^2 = \infty \rightarrow \boxed{\text{no HA}}$$

