What you'll Learn About

- Finite Limits as x approaches positive or negative infinity
- End Behavior Models
- Infinite Limits as x approaches a value

Find the limit as $x \to \pm\infty$

4A) $\lim_{x \to \infty} \frac{x+3}{3x^3 - x + 1} =$

4B) $\lim_{x \to \infty} \frac{3x^3 - x + 1}{x+3} =$

4C) $\lim_{x \to \infty} \frac{3x^3 - x + 1}{x^3 + 3} =$

4D) $\lim_{x \to -\infty} \frac{5x^2 - x + 2}{5x^2 + 10}$

4E) $\lim_{x \to -\infty} \frac{x^3 + x - 1}{x^2 - 5x + 2}$

22A) $\lim_{x \to \infty} \left(\frac{5}{x} + 2\right)\left(\frac{8x^2 - 1}{2x^2}\right)$

22B) $\lim_{x \to -\infty} \left(\frac{5}{x} + 2\right)\left(\frac{8x^2 - 1}{2x^2}\right)$

22C) $\lim_{x \to \infty} \left(\frac{5}{x} + 2\right)\left(\frac{8x^3 - 1}{2x^2}\right)$

22D) $\lim_{x \to -\infty} \left(\frac{5}{x} + 2\right)\left(\frac{8x^3 - 1}{2x^2}\right)$

$$\lim_{x \to -2^+} \frac{x}{x+2} = -\infty$$

Find the limit as x approaches a number

14A) $\lim_{x \to -2^+} \frac{x}{x+2} = \frac{-2}{0}$ 14B) $\lim_{x \to -2^-} \frac{x}{x+2} = \infty$ 14C) $\lim_{x \to -2} \frac{x}{x+2} =$ DNE

Vertical asy

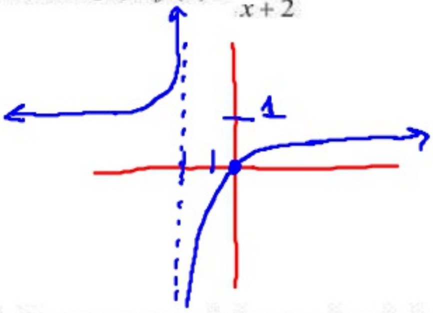
$x = -1.9$

$y = \frac{-1.9}{-1.9+2} = \frac{-1.9}{.1} = -19$

$x = -2.1$

$y = \frac{-2.1}{-2.1+2} = \frac{-2.1}{-.1} = 21$

Using the limits found above graph $f(x) = \frac{x}{x+2}$



$\lim_{x \to \pm\infty} f(x) = 1$

Describe

$\lim_{x \to -\frac{1}{2}^-} f(x) = \infty$

$x = -.6$ $y = \frac{+}{(-)(-)}$

$\lim_{x \to -\frac{1}{2}^+} f(x) = -\infty$

$x = -.4$ $y = \frac{+}{(+)(-)} = -\infty$

$\lim_{x \to -\frac{1}{2}} f(x) =$ DNE

Find the vertical asymptotes of the graph and then describe the behavior to the left and right of the vertical asymptote

30. $f(x) = \frac{1-x}{2x^2 - 5x - 3} = \boxed{\frac{1-x}{(2x+1)(x-3)}}$

VA:

$2x+1 = 0$

$x = -\frac{1}{2}$

$x - 3 = 0$

$x = 3$

Describe

$\lim_{x \to 3^-} f(x) = +\infty$

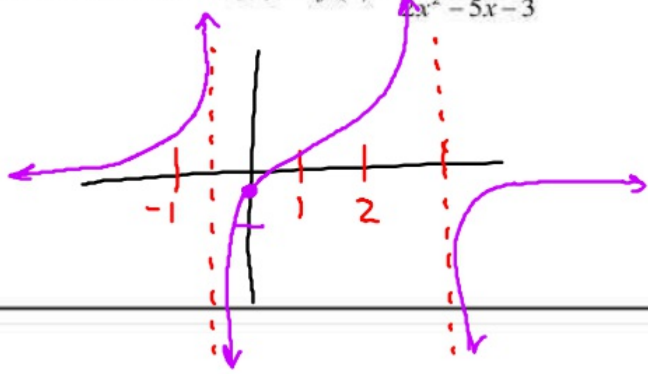
$x = 2.9$ $y = \frac{-}{(+)(-)}$

$\lim_{x \to 3^+} f(x) = -\infty$

$x = 3.1$ $y = \frac{-}{(+)(+)}$

$\lim_{x \to 3} f(x) =$ DNE

Use your results from above to sketch a graph of $f(x) = \frac{1-x}{2x^2 - 5x - 3}$

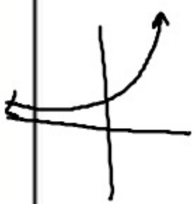


$\lim_{x \to \infty} f(x) = 0$

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

$e^{-x} = \frac{1}{e^x}$

$y = e^x$



Find the limit of the functions that involve e^x

3. $\lim_{x\to\infty} \frac{e^{-x}}{x} = 0$ $\qquad$ $\lim_{x\to-\infty} \frac{e^{-x}}{x} = \infty$

A) $\lim_{x\to\infty} \frac{e^x+2x}{2x} =$

$\lim_{x\to\infty} \frac{e^x}{2x} + \frac{2x}{2x}$

$\boxed{\lim_{x\to\infty} \frac{e^x}{2x} + 1 = \infty}$

B) $\lim_{x\to-\infty} \frac{e^x+2x}{2x} =$

$\lim_{x\to-\infty} \cancel{\frac{e^x}{2x}} + 1 =$

$0 + 1 = 1$

Find the limit of the functions that involve sine and cosine

C) $\lim_{x\to-\infty} \frac{x^3+cosx}{x^3}$

$\lim_{x\to-\infty} \frac{x^3}{x^3} + \frac{\cos x}{x^3}$

$\lim_{x\to-\infty} 1 + \frac{\cos x}{x^3} = 1$

D) $\lim_{x\to+\infty} \frac{x^3+cosx}{x^3}$

$\lim_{x\to\infty} 1 + \frac{\cos x}{x^3} = 1$

E) $\lim_{x\to\infty} \sin\left(\frac{1}{x}\right)$

$\sin 0 = 0$

F) $\lim_{x\to\infty} \frac{\sin\left(\frac{1}{x}\right)}{1+\left(\frac{1}{x}\right)} = \frac{0}{1+0} = 0$

Find the limit of the functions that involve absolute value

8A) $\lim_{x\to\infty} \frac{5x-2}{|x|-1} = 5$ $\qquad$ 8B) $\lim_{x\to-\infty} \frac{5x-2}{|x|-1} = -5$