Warm Up

Describe the end behavior of f(x).

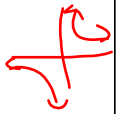
$$f(x) = \frac{3x+1}{x-2}$$

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

$$f(x) = \frac{4x^2 - 3x + 5}{2x^3 + x - 1}$$

$$\text{e.b.m.} = \frac{3\cancel{x}}{\cancel{x}} = 3$$

$$\text{e.b.m.} = \frac{2}{x}$$



e.b. $y = 0$

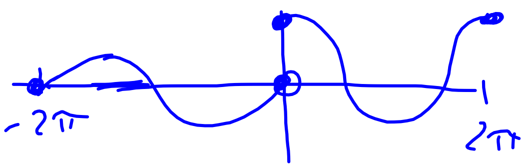
$$f(x) = \frac{3x^3 - x + 1}{x+3}$$

$$\text{e.b.m} = 3x^2$$

e.b. $y \to \infty$

55.

57.

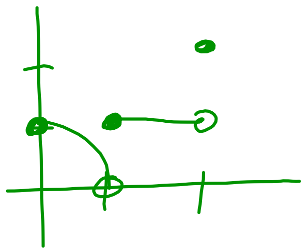


$x \neq -2\pi, 0, 2\pi$

$(-2\pi, 0) \cup (0, 2\pi)$

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

57.



$(0, 1) \cup (1, 2)$

70.

$$f(x) = \begin{cases} 2-x & x \le 1 \\ \frac{x}{2}+1 & x > 1 \end{cases}$$

$f(1) = 2-1 = 1$

76. $f(x) = \sqrt{3x-2}$

$f(2) = \sqrt{3(2)-2} = \sqrt{4} = 2$

$=$

$\lim_{x \to 2} f(x) = \sqrt{4} = 2$

61.

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

$$x^2 \cdot \quad x^2 \cdot \quad x^2 \cdot$$

$$-1 \le \sin\left(\frac{1}{x^2}\right) \le 1$$

$$-x^2 \le x^2 \sin\left(\frac{1}{x^2}\right) \le x^2$$

2.2 Limits involving Infinity

Use the table on your calculator to investigate the limit numerically:

$$\lim_{x\to\infty} \frac{1}{x} = 0$$

$$\lim_{x\to-\infty} \frac{1}{x} = 0$$

1, 2, 13, 14, 27, 41 - 43

Definition of a Horizontal Asymptote:

If $\lim_{x \to \infty} f(x) = b$ *or* $\lim_{x \to -\infty} f(x) = b$ then there is a HA at y = b

Find the horizontal asymptotes:

$$f(x) = \frac{\sin x}{x}$$

$$f(x) = \frac{x}{\sqrt{x^2 + 1}}$$

Estimate: (remember this includes both the left and right hand limits!)

$$\lim_{x \to 0} \frac{1}{x} =$$

Definition of a Vertical Asymptote:

$$\lim_{x \to a^+} f(x) = \pm\infty$$

or

$$\lim_{x \to a^-} f(x) = \pm\infty$$

then there is a VA at x = a

Find the vertical asymptotes:

$$f(x) = \frac{1}{x^2}$$

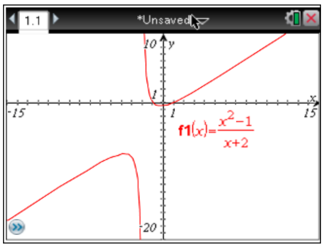
$$f(x) = \frac{2}{x-1}$$

End Behavior Models:

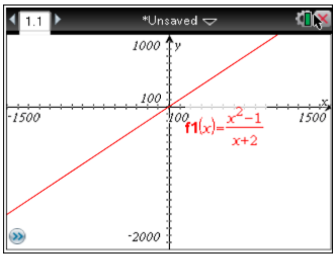
$$f(x) = \frac{x^2 + 1}{x + 2}$$

Graph f(x) using the following windows:

[-15,15] [-20,10]



[-1500, 1500] [-2000,1000]



what is an end-behavior model for f(x):

Find the end behavior models:

$$y = \frac{2x^5 + x^4 - x^2 + 1}{3x^2 - 5x + 7}$$

$$y = \frac{x+1}{3x^2 - 4x + 5}$$