1. Give an example of a function f for which $\lim_{x \to \infty} f(x) = 2$, $\lim_{x \to 1^+} f(x) = \infty$ and $\lim_{x \to 1^-} f(x) = -\infty$.

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

2. $\lim_{x \to \infty} \cos \left(\frac{\pi x^2 + 12x - 15}{x^2 - 1} \right) = \cos \left(\frac{\lim_{x \to \infty} \frac{\pi x^2 + 12x - 15}{x^2 - 1}}{\chi^2 - 1} \right)$ $= \cos \left(\frac{\lim_{x \to \infty} \frac{\pi x^2 + 12x - 15}{x^2 - 1}}{\chi^2 - 1} \cdot \frac{12x - 15}{x^2} \right) = \cos \left(\frac{\lim_{x \to \infty} \frac{\pi x^2 + 12x - 15}{x^2 - 1}}{\chi^2 - 1} \cdot \frac{12x - 15}{x^2} \right)$

$$=\cos\left(\frac{\pi+o-o}{1-o}\right)=\cos\left(\pi\right)=\left[-1\right]$$

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

denominator approaches, o, and is positive.

4. State the asymptotes (both vertical and horizontal, if any) of the function $f(x) = \frac{x-4}{x^2-3x-4}$

$$f(x) = \frac{x-4}{(x-4)(x+1)} = \frac{1}{x+1}$$

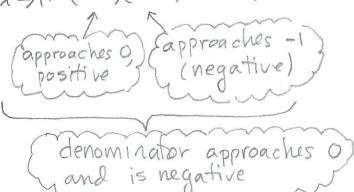
Vertical Asymptote(s): $\chi = 1$

Horizontal Asymptote(s): $\underline{y} = 0$

1. Give an example of a function f for which $\lim_{x \to \infty} f(x) = 1$, $\lim_{x \to 2^+} f(x) = \infty$ and $\lim_{x \to 2^-} f(x) = -\infty$.

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

 $2. \lim_{x \to 1^+} \frac{1}{x^2 - 3x + 2} = \lim_{x \to 1^+} \frac{1}{(x - 1)(x - z)} = \left(-\infty \right)$



3. $\lim_{x \to \infty} \sin \left(\frac{\pi x^2 + 12x - 15}{2x^2 - 4x + 3} \right) = \sin \left(\frac{\lim_{x \to \infty} \frac{\pi x^2 + 12x - 15}{2x^2 - 4x + 3} \cdot \frac{1/x^2}{1/x^2} \right)$

$$= \sin\left(\frac{\lim_{x \to \infty} \frac{T + 1^2}{x} - \frac{15}{x^2}}{2 - \frac{4}{x} + \frac{3}{x^2}}\right) = \sin\left(\frac{TT + 0 - 0}{2 - 0}\right)$$

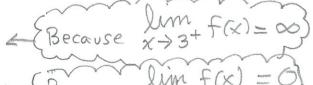
$$= \sin\left(\frac{\pi}{2}\right) = \boxed{1}$$

4. State the asymptotes (both vertical and horizontal, if any) of the function $f(x) = \frac{x-1}{x^2 - 4x + 3}$.

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

Vertical Asymptote(s): $\chi = 3$

Horizontal Asymptote(s): $\underline{\mathcal{Y}} = 0$



Because x→00