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

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

3.  $\lim_{x \to 2} \frac{1}{x^2 - 4x + 4} = \lim_{x \to 2} \frac{1}{(x - 2)(x - 2)} = \frac{1}{(x - 2)^2} = \infty$   $\begin{cases} \text{denominator approaches} \\ 0, \text{ and is positive.} \end{cases}$ 

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

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

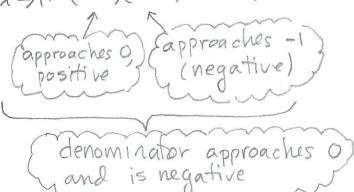
Vertical Asymptote(s): X = |

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

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

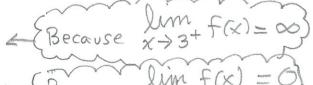
$$= \sin\left(\frac{\pi}{2}\right) = \boxed{1}$$

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