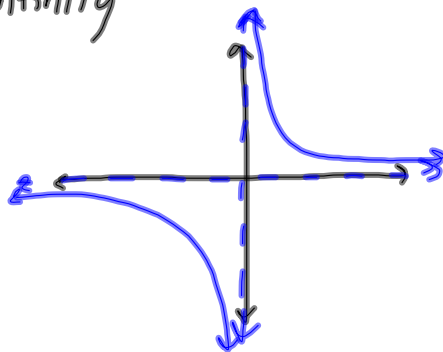


## 2.2 Limits to Infinity

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

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

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



HA:  $y=b$  is a HA of  $f(x)$  iff  
 $\lim_{x \rightarrow \infty} f(x) = b$  or  $\lim_{x \rightarrow -\infty} f(x) = b$ .

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

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

VA:  $x=a$  is a VA of  $f(x)$  iff

$$\lim_{x \rightarrow a^+} f(x) = \pm\infty \text{ or } \lim_{x \rightarrow a^-} f(x) = \pm\infty$$

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1.  $f(x) = \frac{x+4}{x^2-9}$  power:  $y = \frac{x}{x^2} = \frac{1}{x}$

HA:  $y=0$   
 $\lim_{x \rightarrow \infty} f(x) = 0$

VA:  $x^2-9=0$   
 $x = \pm 3$

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

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

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

$$\text{power: } y = \frac{2x^2}{x^2} = 2$$

$$\text{HA: } y = 2$$

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

$$\text{VA: } x^2 - 4 = 0$$

$$x = \pm 2$$

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

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

$$3. f(x) = \cos\left(\frac{1}{x}\right)$$

$$\text{HA: } y = 1$$

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

VA: none

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$$4. f(x) = \frac{2x - 1}{|x| - 3}$$

$$\text{HA: } y = \pm 2$$

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

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

$$\text{VA: } x = \pm 3$$

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

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

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$$5. f(x) = \frac{5x + \sin x}{x}$$

HA:  $y = 5$

$$\lim_{x \rightarrow \infty} f(x) = 5$$

VA: none

$$6. f(x) = \frac{4x^3 + 2x - 1}{x + 3}$$

power:  $y = \frac{4x^3}{x} = 4x^2$

HA: none

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

VA:  $x = -3$

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

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Analytically

Find HA & VA

Rules (degrees)

domain restrictions

Numerically

Plug in #'s  $\hat{=}$

Sep 11-1:47 PM