

Asymptotes

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$$y(x) = \frac{6x-2}{x^2+5x-6}$$

Graph the function

Solution

Y-intercept, $x=0$

$$y(0) = \frac{-2}{-6} = \frac{1}{3} ; (0, \frac{1}{3})$$

X-intercept, $y=0$

$$\frac{6x-2}{x^2+5x-6} = 0$$

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$$6x - 2 = 0$$

$$6x = 2$$

$$x = \frac{1}{3} \quad ; \quad (\frac{1}{3}, 0)$$

Horizontal Asymptote, $x \rightarrow \pm\infty$

Divide the numerator and the denominator by x

$$y(x) = \frac{6 - \frac{2}{x}}{x + 5 - \frac{6}{x}}$$

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As $x \rightarrow \pm \infty$

$$\frac{2}{x} \rightarrow 0 \quad \& \quad \frac{6}{x} \rightarrow 0$$

So

$$\lim_{x \rightarrow \pm \infty} \frac{6 - \frac{2}{x}}{x + 5 - \frac{6}{x}} \Rightarrow \lim_{x \rightarrow \pm \infty} \frac{6}{x} \Rightarrow 0$$

The horizontal asymptote is

$$y = 0$$

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⇒ Vertical Asymptote

$$y(x) = \frac{2(3x-1)}{(x-1)(x+6)}$$

If $x=1$, then $x-1=0$

If $x=-6$, then $x+6=0$

The vertical asymptotes are

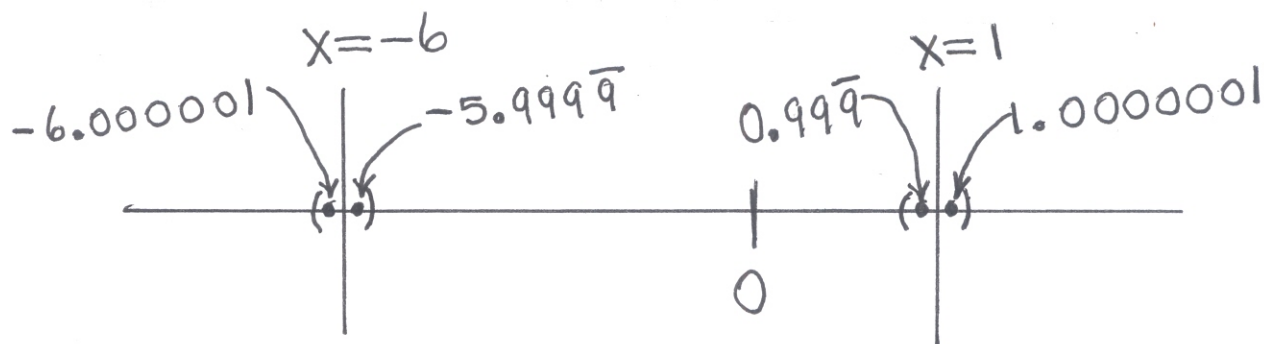
$$x=1 \quad \& \quad x=-6$$

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(#2) Asymptotes

We must analyze the behavior of $y(x)$ for values of x that are extremely close to $x=1$ & $x=6$.



$$\lim_{x \rightarrow -6^-} \frac{2(3x-1)}{(x-1)(x+6)} \Rightarrow \frac{(-)}{(-)(-)} \Rightarrow (-)$$

$$\lim_{x \rightarrow -6^-} y(x) \Rightarrow -\infty$$

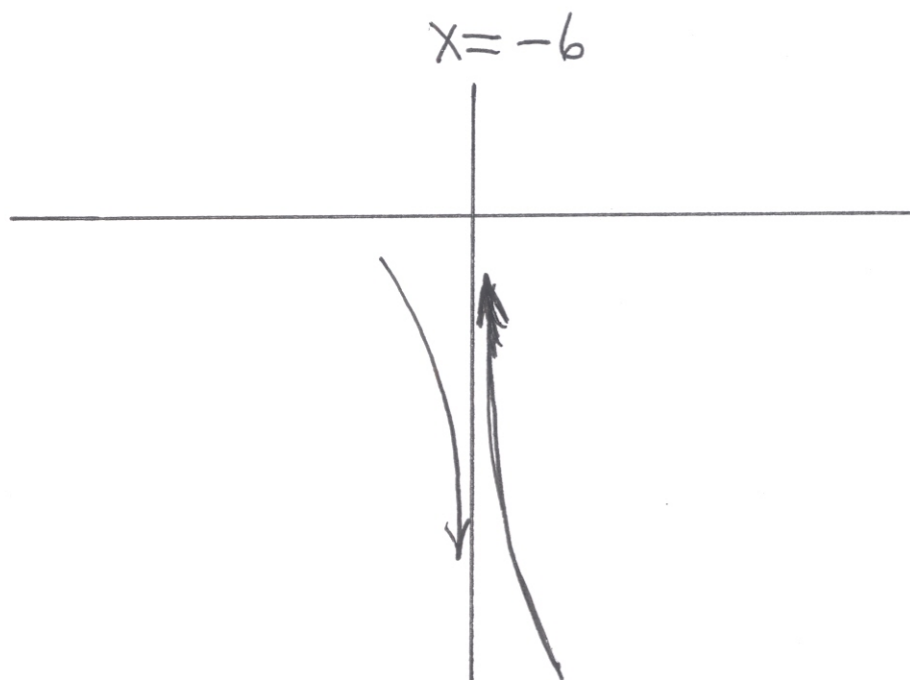
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$$\lim_{x \rightarrow -6^+} \frac{2(3x-1)}{(x-1)(x+6)} \Rightarrow \frac{(-)}{(-)(+)} \Rightarrow \frac{(-)}{(-)} \Rightarrow (+)$$

$$\lim_{x \rightarrow -6^+} y(x) \Rightarrow +\infty$$



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$$\lim_{x \rightarrow 1^-} \frac{2(3x-1)}{(x-1)(x+6)} \Rightarrow \frac{(+)}{(-)(+)} \Rightarrow (-)$$

$$\lim_{x \rightarrow 1^-} y(x) \Rightarrow -\infty$$

$$\lim_{x \rightarrow 1^+} \frac{2(3x-1)}{(x-1)(x+6)} \Rightarrow \frac{(+)}{(+)(+)} \Rightarrow (+)$$

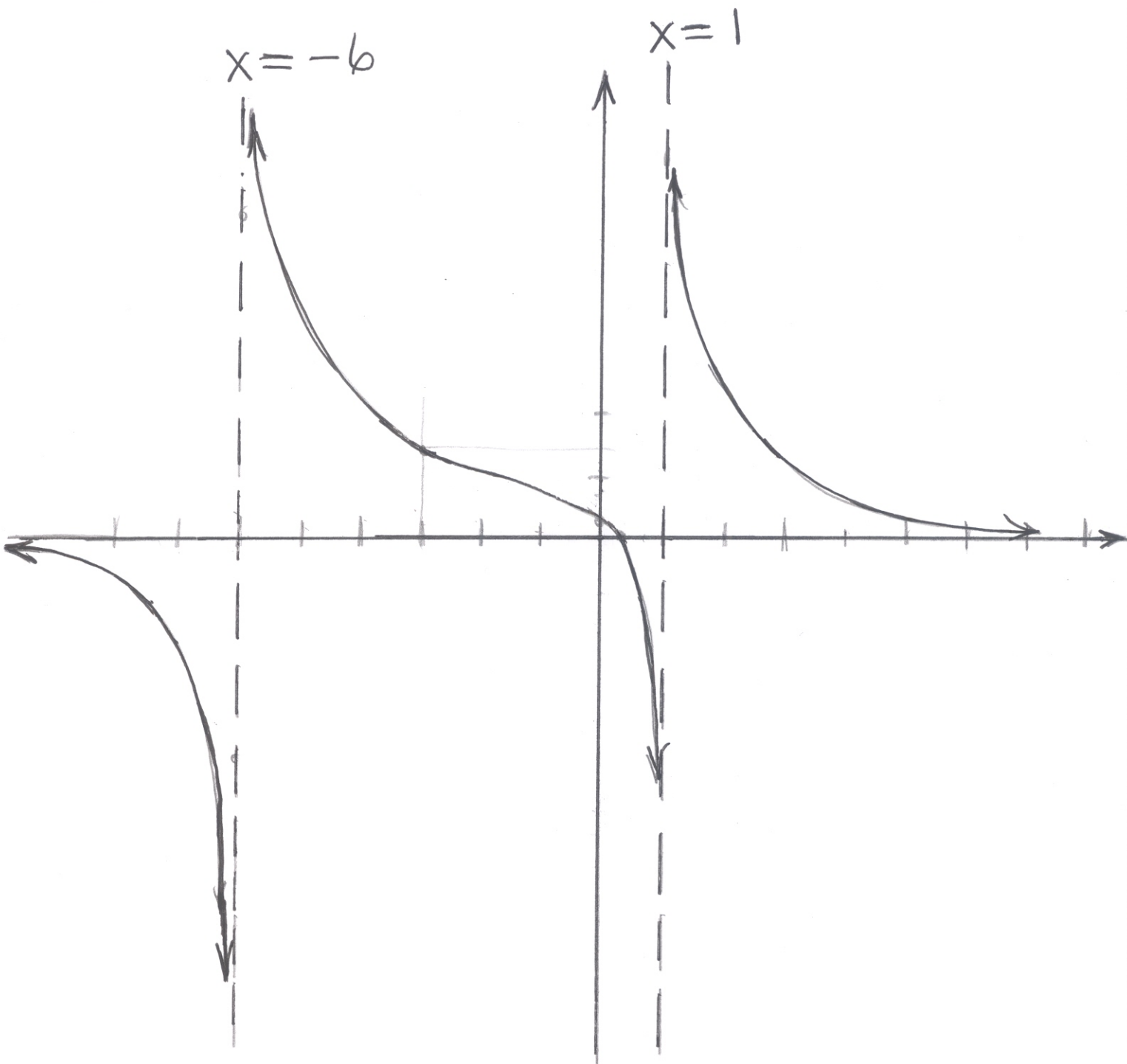
$$\lim_{x \rightarrow 1^+} y(x) \Rightarrow +\infty$$

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Asymptotes

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$$y(x) = \frac{2(3x-1)}{(x-1)(x+6)}$$

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