Math-3
Lesson 3-7
“Holes” and the “Oblique Asymptote”

$$y = \frac{(x+4)}{(x-1)} \qquad y = \frac{(x+4)(x-3)}{(x-1)(x-3)}$$

Zeroes of the numerator are x-intercepts (or are imaginary)

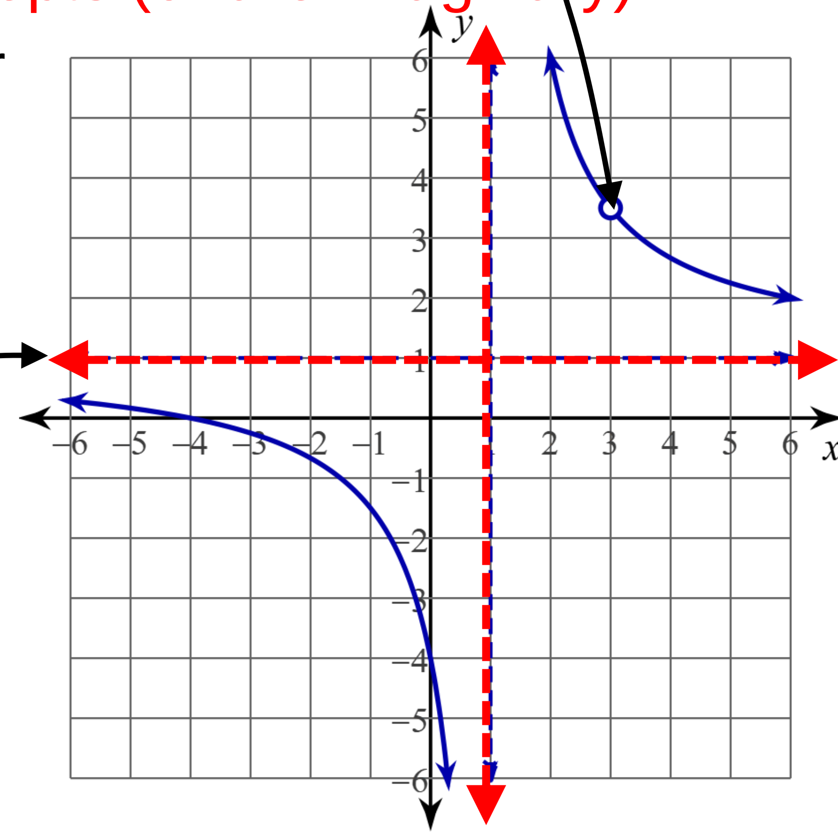
Zeroes of the denominator are either

(1) Vertical asymptotes or

(2) Holes

The ‘quotient’ when you divide a rational equation determines the ‘end behavior.”

$$y = \frac{5}{(x-1)} + 1$$



$$\begin{array}{r|l} & 1 \\ \hline x - 1 & x + 4 \\ & -(x - 1) \\ \hline & \quad 5 \end{array}$$

The 'quotient' when you divide a rational equation determines the 'end behavior.'"

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

$$\begin{array}{r} x \\ x^2 - 4 \overline{)\, x^3 \qquad\qquad} \\ -(x^3 - 4x) \\ \hline 4x \end{array}$$

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

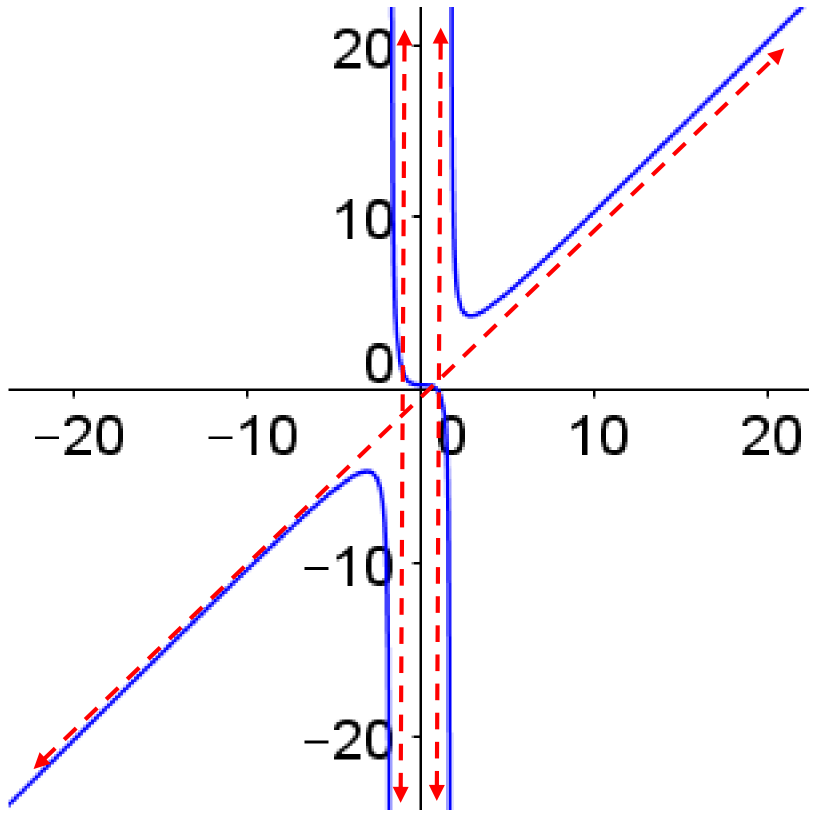
Oblique asymptote:

y = x

VA:

x = -2

x… = 2



Will there be a horizontal asymptote?

$$g(x)=\frac{x^2+2x+4}{x-1}$$

$$\begin{array}{r}
x+3 \\
x-1\,\overline{)\,x^2+2x+4} \\
-(x^2-x) \\
\hline
3x+4 \\
-(3x-3) \\
\hline
7
\end{array}$$

$$g(x)=x+3+\frac{7}{x-1}$$

X→∞ y→?

Use long division.

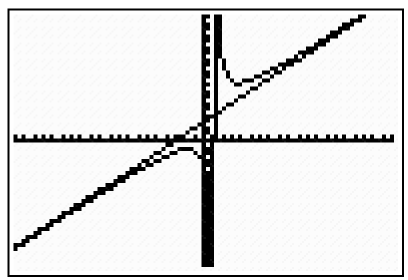
$$g(x)=x+3+\frac{7}{x-1}$$

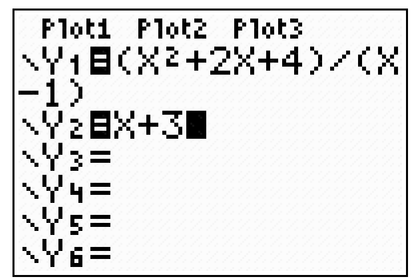
0

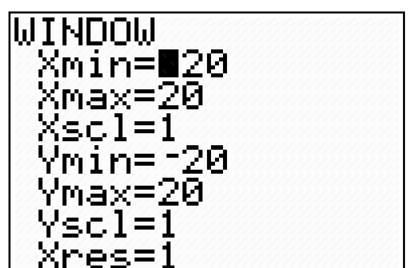
The fraction approaches <u>zero.</u>

X→∞ g(x) → x + 3

<u>Oblique</u> asymptote: y = x + 3







find the oblique asymptote

$$g(x) = \frac{6x^2 + 5x - 2}{3x - 2}$$

Use long division.

$$\begin{array}{r} 2x+3 \\ 3x-2 \overline{\big) 6x^2 + 5x - 2} \\ -(6x^2 - 4x) \\ \hline 9x - 2 \\ -(9x - 6) \\ \hline 4 \end{array}$$

$$g(x) = 2x + 3 + \frac{4}{3x - 2}$$

X→∞ y→?

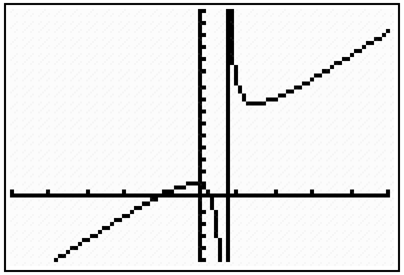
$$g(x) = 2x + 3 + \frac{4}{3x - 2}$$

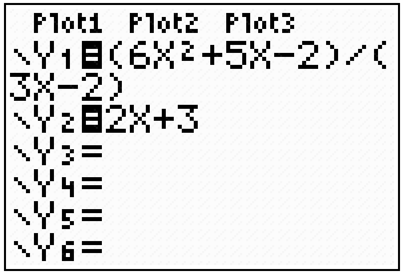
0

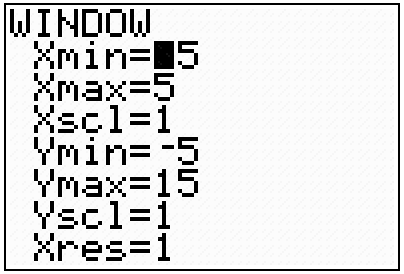
The fraction approaches zero.

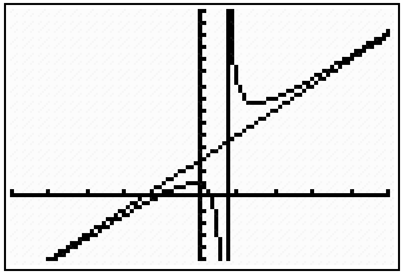
X→∞ g(x) → 2x + 3

Oblique asymptote: y = 2x + 3









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

$$y = \frac{6(x+4)(x+2)}{2(x+3)}$$

x-intercept? (-4, 0), (-2, 0)

y-intercept? (0, 8)

Vertical asymptote? x = -3

holes? f(1) = 45/4

Oblique asymptote? $y = 3x + 9$

$$\begin{array}{r} 3x \quad +9 \\ 2x+6 \overline{)\, 6x^2 + 36x + 48} \\ -(6x^2 + 18x\ ) \\ \hline 18x + 48 \\ -(\ 18x + 54\ ) \\ \hline -6 \end{array}$$

$$y = 3x + 9 + \frac{-6}{2x+6}$$

$$y = 3x + 9 + \frac{-3}{x+3}$$

4

$$g(x) = 2x + 3 + \frac{4}{3x-2}$$

X→∞ y→?

Your turn: find the asymptote

$$g(x)=\frac{x^3+2x^2+3x-4}{x+2}$$

$$\begin{array}{r} x^2+3 \\ x+2\,\overline{)\,x^3+2x^2+3x-4} \\ -(x^3+2x^2) \\ \hline 3x-4 \\ -(3x+6) \\ \hline -10 \end{array}$$

$$g(x)=x^2+3-\frac{10}{x+2}$$

X→∞   y→?

Use long division.

$$g(x)=x^2+3-\frac{10}{x+2}$$

0

The fraction approaches zero.

X→∞   g(x) → x^2+3

Oblique asymptote: $y=x^2+3$