

Trig 3.7

Graph rational functions

Determine horizontal, vertical, slant asymptotes, point discontinuities

rational function $y=1/x$

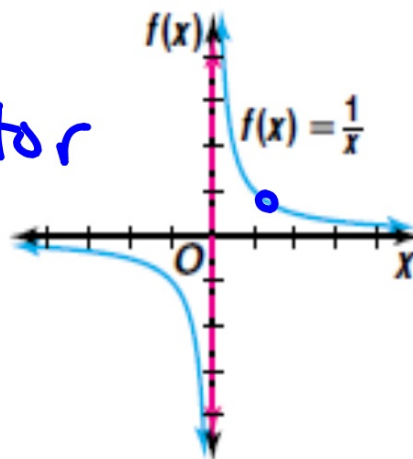
vertical asymptote **VA** $x=0$

horizontal asymptote **HA** $y=0$

point discontinuity - repeated factor

slant asymptote - $y = mx + B$

common factor



Determine the equations of the vertical and horizontal asymptotes, if any, of each function.

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

$x-5=0$
 $x=5$

VA $x=5$

HA $y = \frac{x}{x} = 1$

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

$x-2=0$ $x \neq -1$ $\frac{1}{2}$
 $+2$ $+2$

VA $x=2$
 $x=-1$

HA none

$\frac{x^3}{x^2-x-2}$

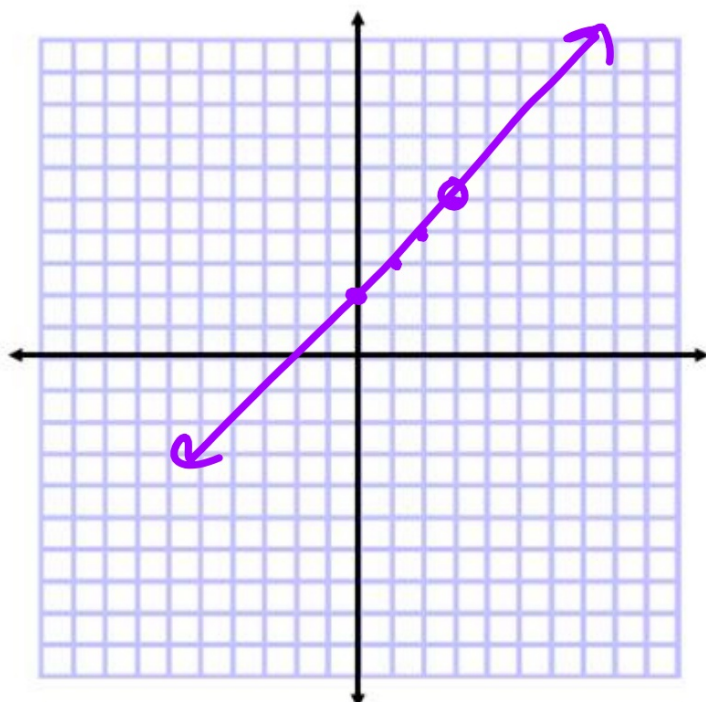
$y = x+1$

$(x^2-x-2) \overline{) x^3}$
 $-x^3 + x^2 + 2x$
 $\hline x^2 + 2x$
 $-x^2 + x + 2$
 $\hline 3x + 2$

horizontal: degrees
 if denom is higher:
 if it's a tie:
 if denom is lower:

There are times when the numerator and denominator of a rational function share a common factor. Consider $f(x) = \frac{(x+2)(x-3)}{x-3}$. Since an x -value of 3 results in a denominator of 0, you might expect there to be a vertical asymptote at $x = 3$. However, $x - 3$ is a common factor of the numerator and denominator.

$$x = 3$$



r than denom

A11 - HA SA VA PD

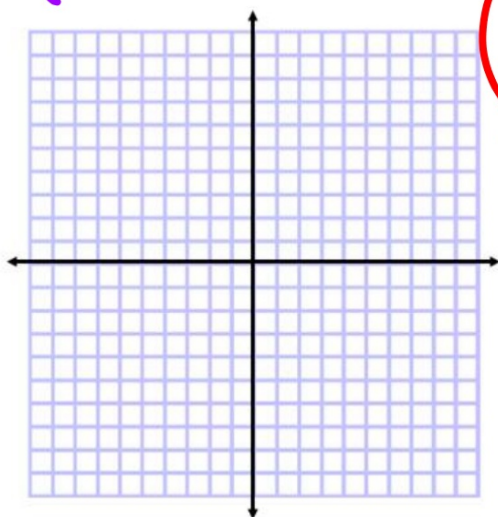
Determine the slant asymptote of each function.

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

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

SA =

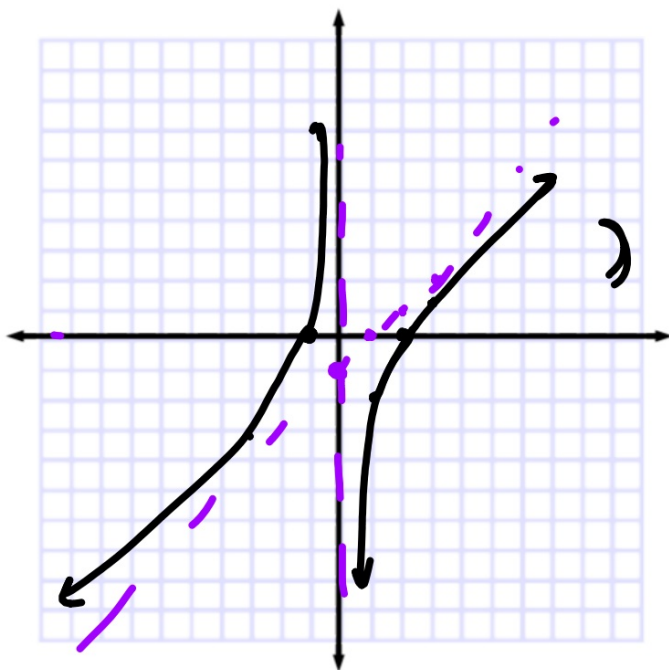
$y = x - 1$



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

Graph each function.

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



Determine:

~~common factors (holes)~~

VA $x = 0$

~~HA*~~

SA* $y = x - 1$

crossing point(s)

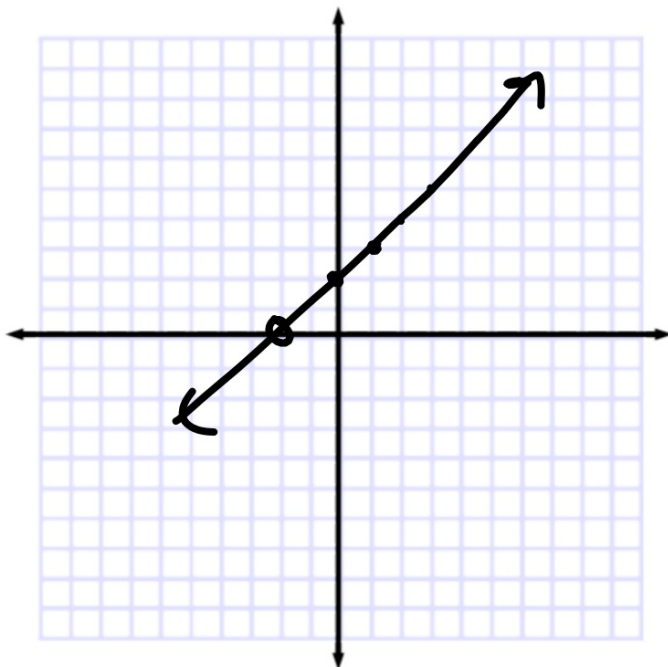
Test point(s)

* Can have one or the other, but not both

1	$\frac{-1(2)}{1}$	-2
3	$\frac{1 \cdot 4}{3}$	$1\frac{1}{3}$
-1	$\frac{-3 \cdot 0}{-1}$	0
-3	$\frac{-5 \cdot -2}{-3}$	$\frac{10}{-3} = -3\frac{1}{3}$

$$12. y = \frac{(x+2)(x+2)}{\cancel{x+2}}$$

$$y = x + 2$$



Determine:
common factors

VA

HA

crossing point(s)

SA

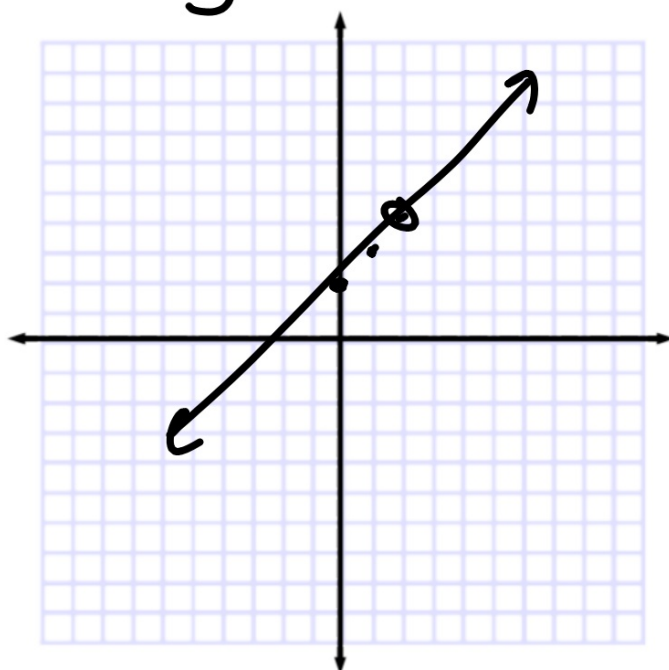
Test point(s)

PD $x = -2$

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

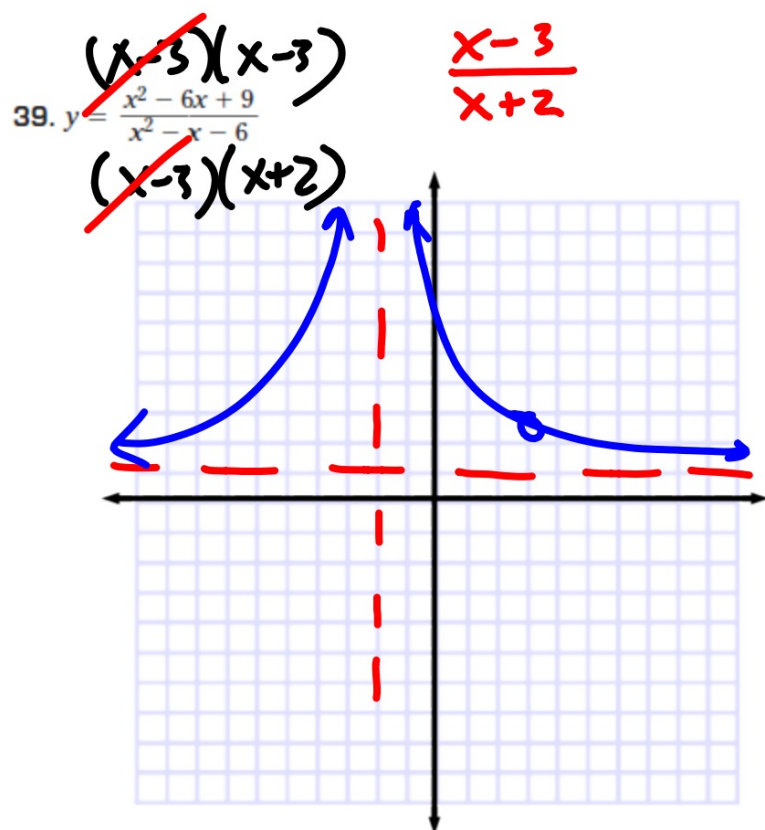
$(x-2)(x+2)$

$y = x + 2$



Determine:
 common factors
 VA
 HA
 crossing point(s)
 SA
 Test point(s)

PD $x = 2$



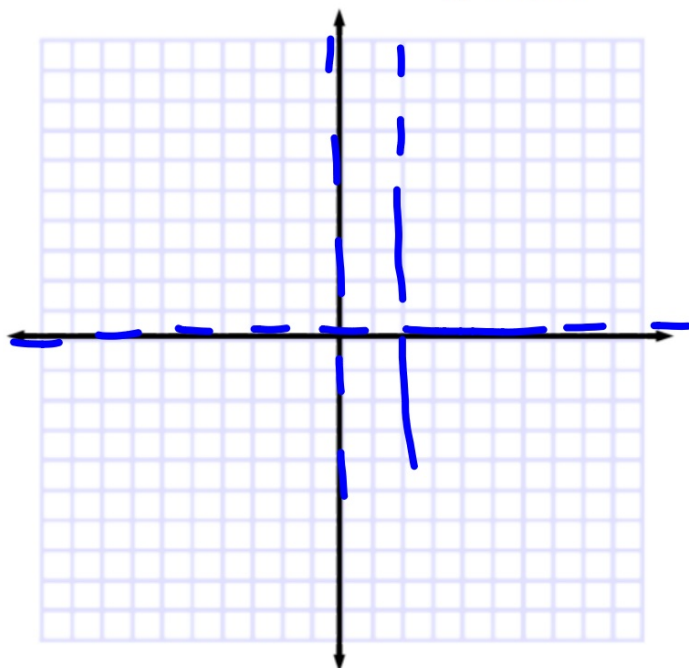
Determine:
 common factors
 VA
 HA
 crossing point(s)
 SA
 Test point(s)

PD $x = 3$

5 Graph $y = \frac{(x+3)(x+1)}{x(x+3)(x-2)}$.

$$\frac{x+1}{x(x-2)}$$

$$x^2 - 2x$$



Determine:
 common factors
 VA
 HA
 crossing point(s)
 SA
 Test point(s)

PD $x = -3$

WB 3.7