Trig 3.7

Graph rational functions
Determine horizontal, vertical, slant asymptotes

rational function y=1/x

vertical asymptote

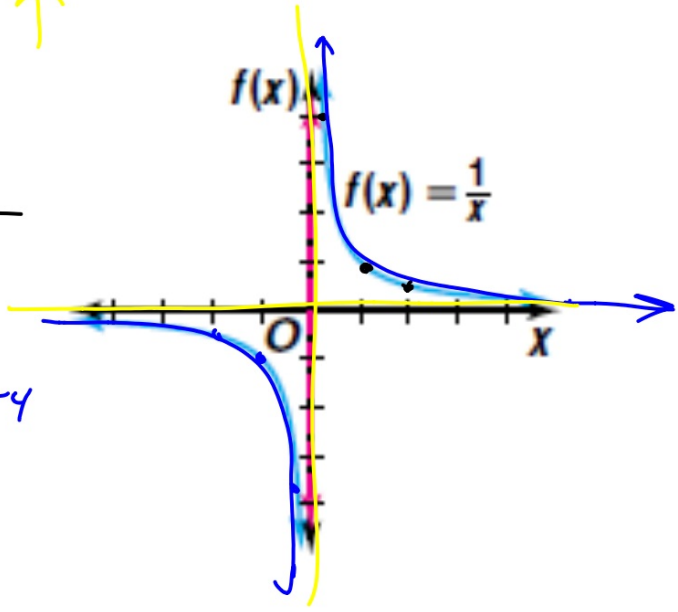
horizontal asymptote

point discontinuity

slant asymptote

common factor

x	$\frac{1}{x}$
-1	-1
-2	$-\frac{1}{2}$
$-\frac{1}{4}$	-4
0	undefined



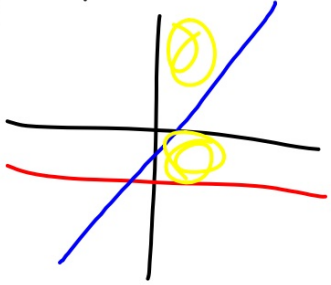
deg denom $y=0$ (higher)
ratio (equal)
(lower)

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

5. $f(x) = \dfrac{x}{(x-5)}$ $x-5=0$, $x=5$ maybe slant

VA $x=5$

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



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

$x-2=0$ $x+1=0$

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

HA none

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

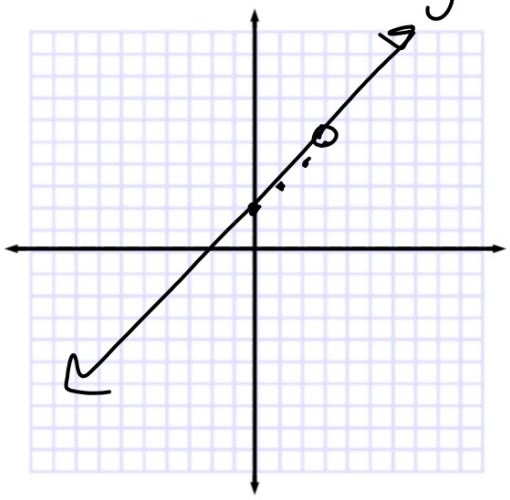
There are times when the numerator and denominator of a rational function share a common factor. Consider $f(x) = \frac{(x+2)(x-3)}{(x-3)}$. Since an x-value of 3 results in a denominator of 0, you might expect there to be a vertical asymptote at $x = 3$. However, $x - 3$ is a common factor of the numerator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

$f(x) = \frac{x^2 - x - 6}{x - 3}$ point discont.

$y = x + 2$

$x - 3 = 0$

$x = 3$



Comr inuity

Graph each function.

35. $y = \dfrac{(x-2)(x+1)}{x}$

$y = x - 1$

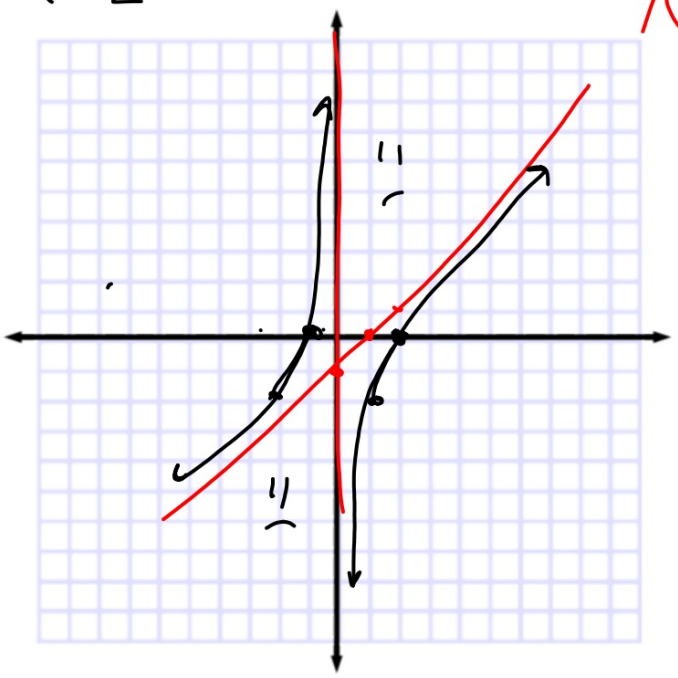
$x \overline{)\, x^2 - x - 2}$

$-x^2 + x$

-2

$x - 2 = 0$ $\quad x = 2$

$x + 1 = 0$ $\quad x = -1$



Determine:
common factors (holes)
VA $x = 0$
~~HA*~~
SA* $y = x - 1$
crossing point(s) x-intercept
Test point(s)
* Can have one or the other, but not both

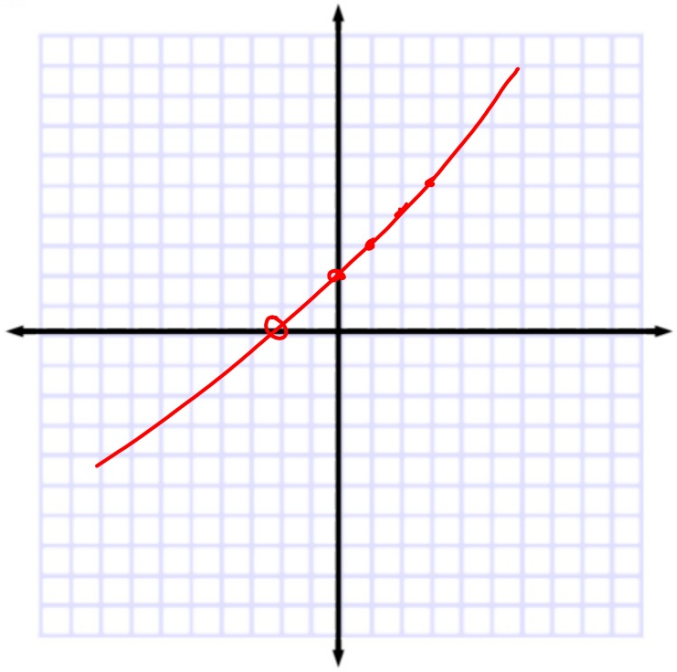
PD - none

$\dfrac{x^2 - x - 2}{x}$ $\quad \dfrac{(x-2)(x+1)}{x}$

1	$\frac{-2}{1}$	-2
2	$\frac{4-2-2}{2}$	0
-1	$\frac{1+1-2}{-1}$	0
-2	$\frac{4+2-2}{-2}$	$\frac{4}{-2} = -2$

12. $y = \dfrac{x^2 + 4x + 4}{x + 2}$ $\dfrac{(x+2)(x+2)}{x+2}$

$y = x + 2$

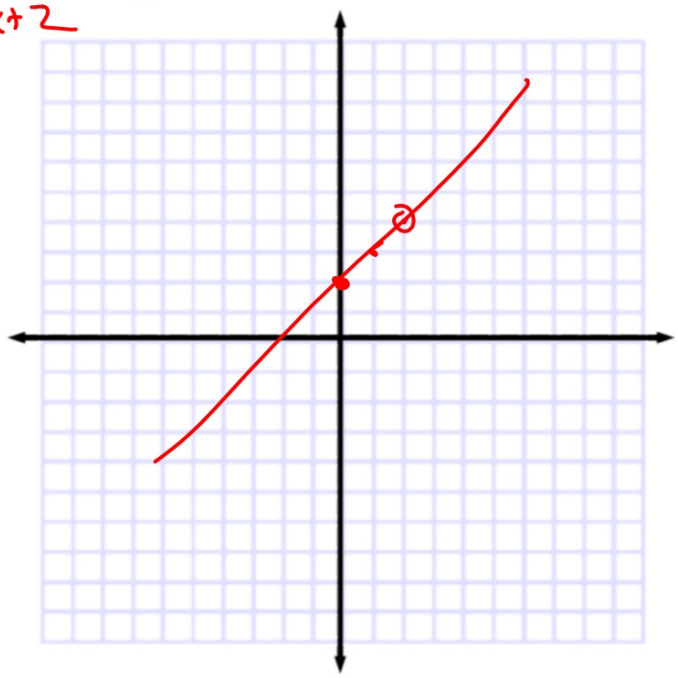


Determine:
common factors
~~VA~~
HA
crossing point(s)
SA
Test point(s)

$x = -2$ P.D.

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

$y = x+2$



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

PD $x=2$

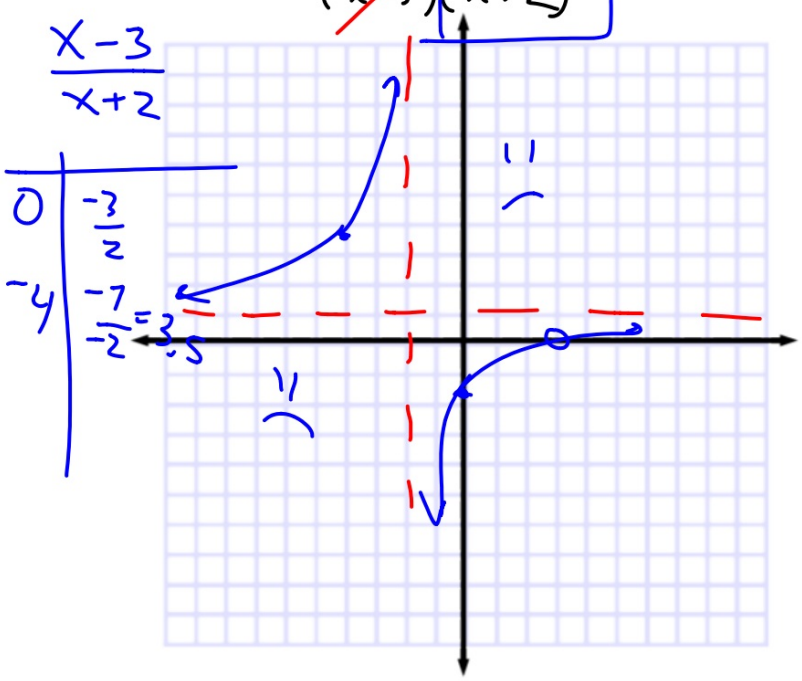
39. $y = \dfrac{x^2 - 6x + 9}{x^2 - x - 6}$

$\dfrac{(x-3)(x-3)}{(x-3)(x+2)}$

$y = \dfrac{x'}{x'} = 1$

$\dfrac{x-3}{x+2}$

0	$-\frac{3}{2}$
-4	$\frac{-7}{-2} = 3.5$



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

PD $x = 3$

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

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

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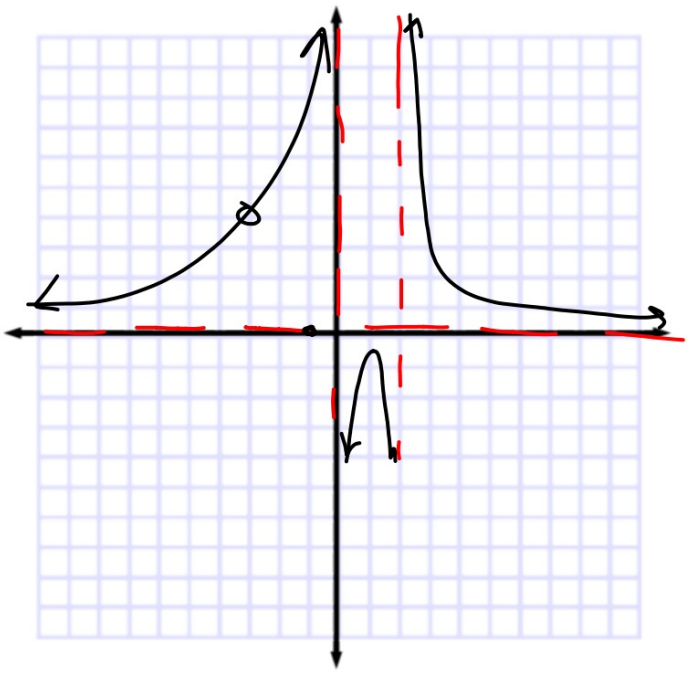

Determine:
common factors
VA $x=0$ $x=2$
HA
crossing point(s)
SA
Test point(s)

PD $x=-3$