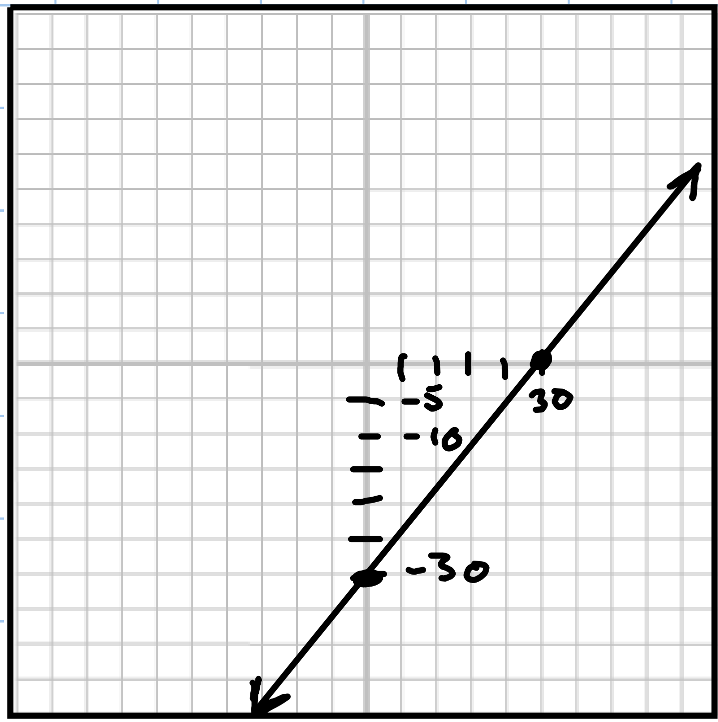
as $x \to -\infty$, $y \to -\infty$

as $x \to \infty$, $y \to \infty$

3.6

49. $f(x) = x-30$



3.6 # 57. $f(x) = -x^3 - x^2 + 5x - 3$

$f(1) = -1 - 1 + 5 - 3 = 0$

$f(-1) = 1 - 1 - 5 - 3 = -8$

$f(0) = -3$

as $x \to -\infty$, $y \to +\infty$

as $x \to +\infty$, $y \to -\infty$

$f(-x) = x^3 - x^2 - 5x - 3$

$\underset{Q}{-x^3} - x^2 + 5x - \underset{P}{3}$

P: 3 $\pm 1, \pm 3 \leftarrow \frac{P}{Q}$

Q: 1 ± 1

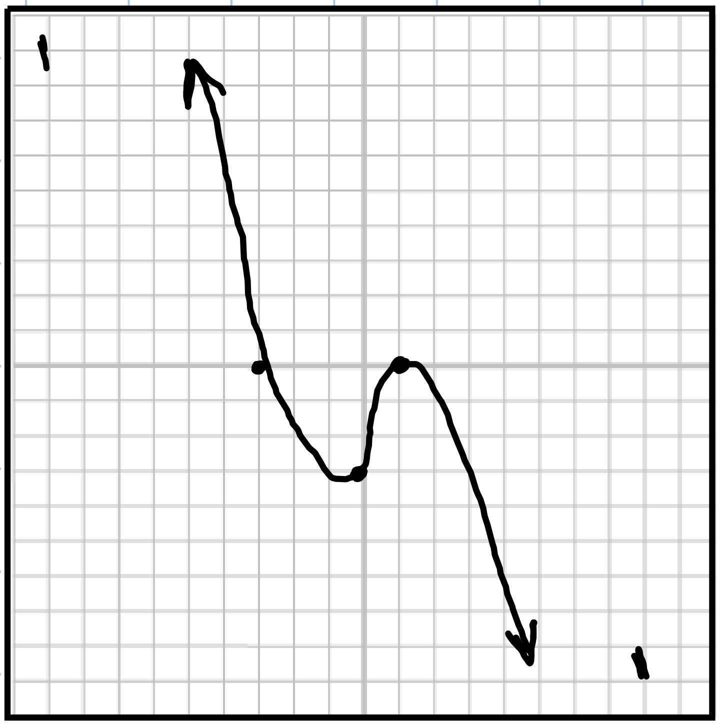
+ real	2	0
− real	1	1
imag	0	2

$$\begin{array}{r|rrrr} 1 & -1 & -1 & 5 & -3 \\ & & -1 & -2 & 3 \\ \hline & -1 & -2 & 3 & 0 \end{array}$$

$(x-1)(-x^2 - 2x + 3) = 0$

$(x-1)(-1)(x^2 + 2x - 3) = 0$

$(x+3)(x-1)$



65 $f(x) = x^3+3x^2+3x+1$

$f(-2) = -1$

$f(2) = 27$

$f(-3) =$

$x^3+3x^2+3x+1 = 0$

Q P

$(x+1)(x^2+2x+1)$

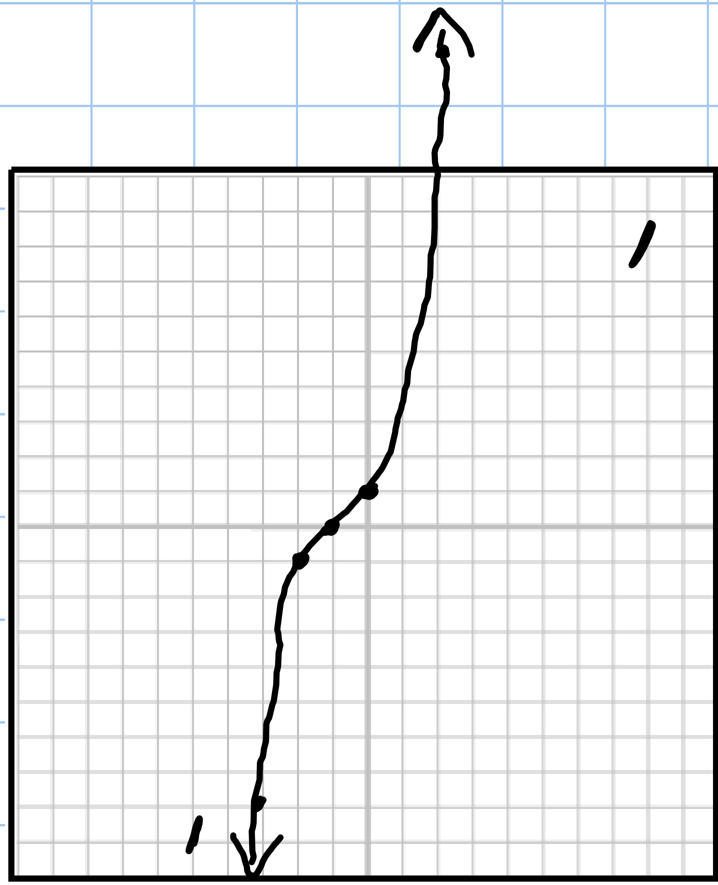
$(x+1)(x+1)$

P: ± 1 ← P/Q

Q: ± 1

1	1	3	3	1
		1	4	7
	1	4	7	8

-1	1	3	3	1
		-1	-2	-1
	1	2	1	0



#67, 3.6

$$x^3 - 3x > 0$$

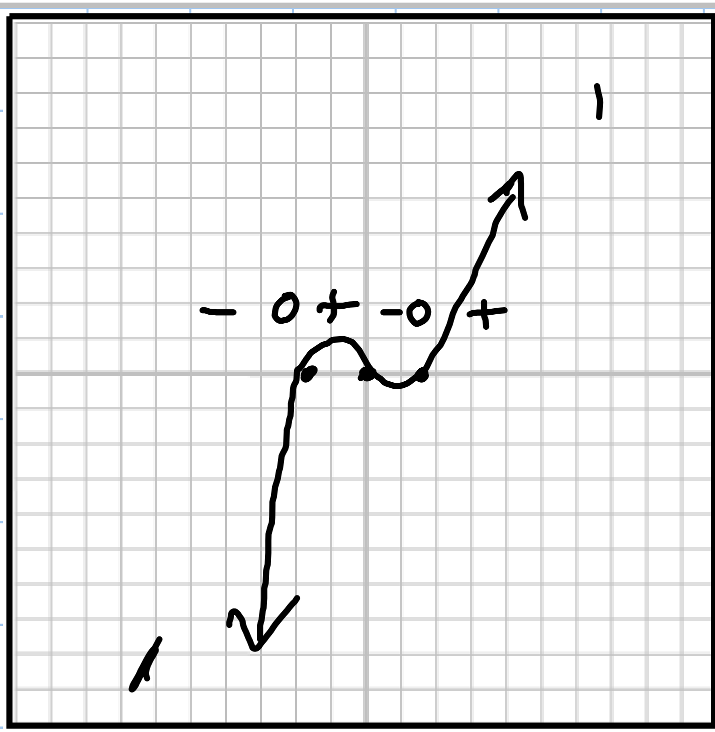
$x^3 - 3x = 0$

$x(x^2 - 3) = 0$

$x = 0$ $\qquad$ $x^2 - 3 = 0$

$x^2 = 3$

$x = \pm\sqrt{3}$



$x^3 - 3x$

as $x \to -\infty$, $y = -\infty$

as $x \to +\infty$, $y = +\infty$

$(-\sqrt{3}, 0) \cup (\sqrt{3}, \infty)$

3.6 #73. $x^3-4x^2-20x+48 \geq 0$

$\underset{Q}{x^3}-4x^2-20x+\underset{P}{48}=0$

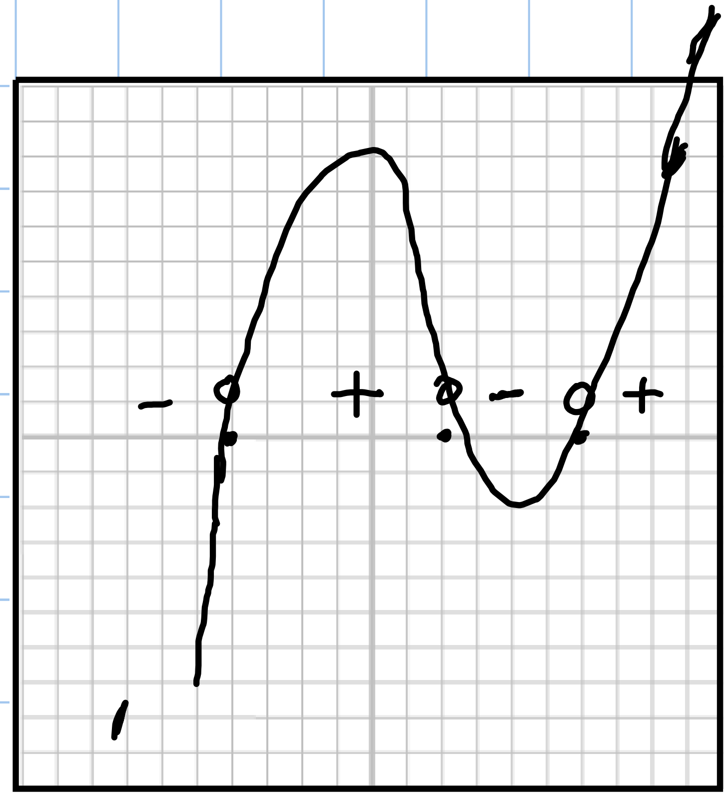
P: 48 $\pm1, \pm2, \pm3, \pm4, \pm$

Q: 1

$(x-2)(x^2-2x-24)=0$

$(x-6)(x+4)=0$

$x = 2, 6, -4$



$$\begin{array}{r|rrrr} 2 & 1 & -4 & -20 & +48 \\ & & 2 & -4 & -48 \\ \hline & 1 & -2 & -24 & 0 \end{array}$$

$[-4, 2] \cup [6, \infty)$

Section 3.7

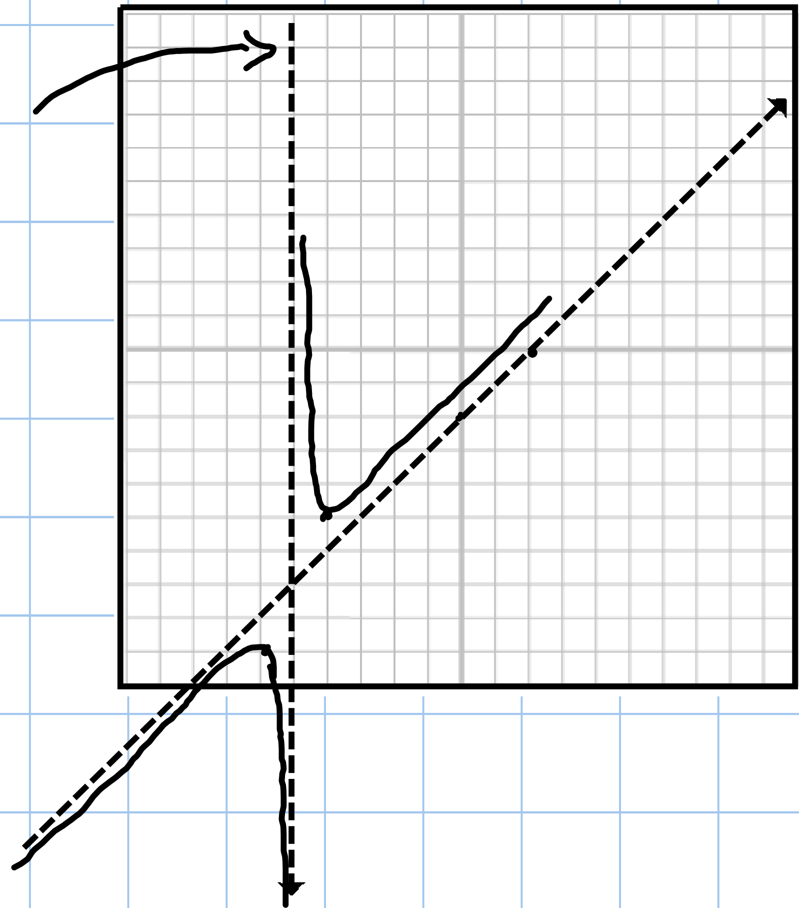
Rational Functions and Inequalities

$$\frac{x^2+3x-9}{x+5}$$

this tells us that we have a vertical asymptote @ $x=-5$

$$\begin{array}{r|rrr} -5 & 1 & 3 & -9 \\ & & -5 & 10 \\ \hline & 1 & -2 & 1 \end{array}$$

$y=x-2$ is an oblique asymptote

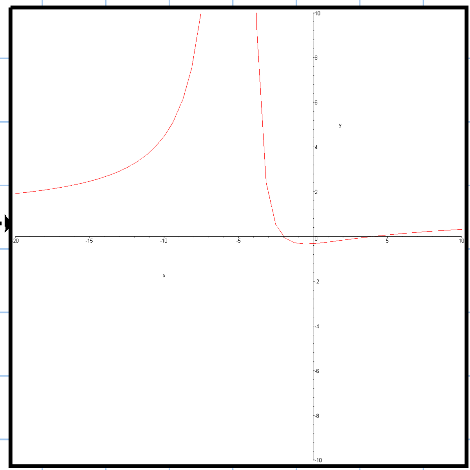


#90. $\dfrac{x^2-2x-8}{x^2+10x+25} \leq 0$

$\dfrac{(x-4)(x+2)}{(x+5)^2} = 0$

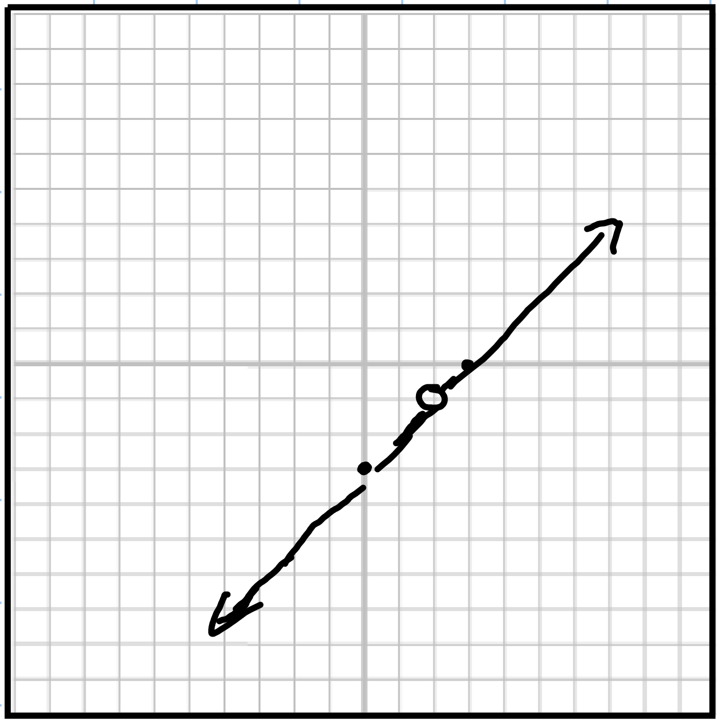
here's the graph we figured out...

and here's the graph using technology...



#68. $\dfrac{x^2-5x+6}{x-2} = \dfrac{(x-3)\cancel{(x-2)}}{\cancel{(x-2)}}$

$x \neq 2$



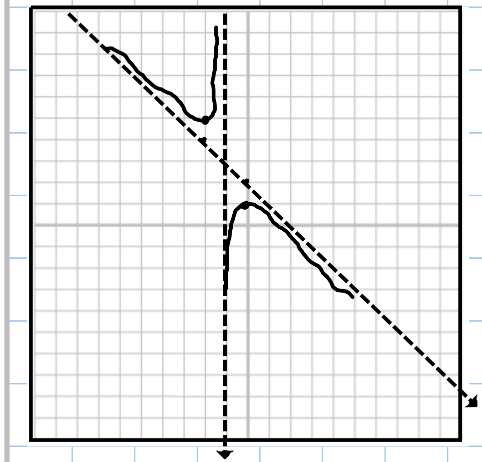
\# 56. (3,7)

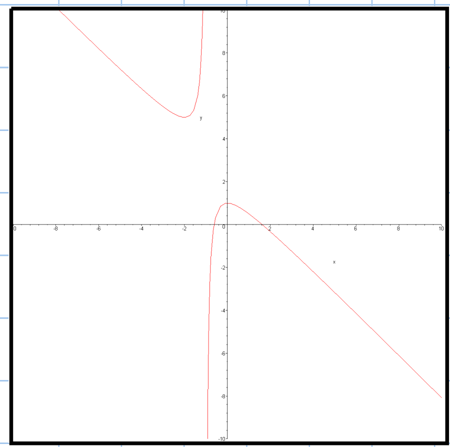
vert. asymp. @ $x = -1$

$$\frac{-x^2+x+1}{x+1} \qquad \frac{-4-2+1}{-1} = \frac{-5}{-1}$$

$$\begin{array}{r|rrr} -1 & -1 & 1 & 1 \\ & & 1 & -2 \\ \hline & -1 & 2 & -1 \end{array}$$

oblique asymp. @ $-x+2$



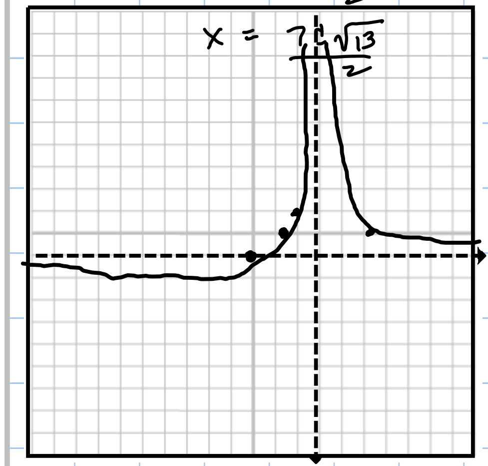


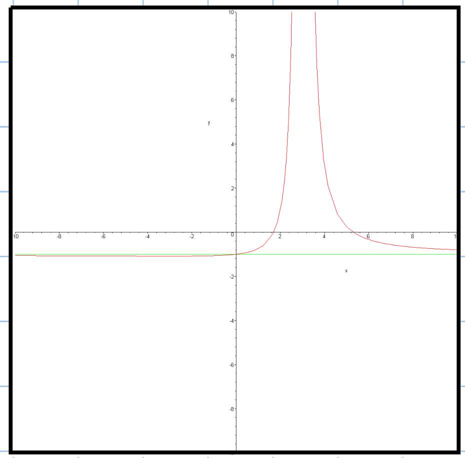
48.

vert. asymptote @ $x=3$ $\quad f(x) = \dfrac{-x^2+7x-9}{x^2-6x+9} = \dfrac{-1(x^2-7x+9)}{(x-3)(x-3)}$

horiz. " @ $y=-1$

$$-x^2+7x-9=0$$
$$x^2-7x+9=0$$
$$x^2-7x+\frac{49}{4} = -9+\frac{49}{4}$$
$$\left(x-\frac{7}{2}\right)^2 = \frac{13}{4}$$
$$x-\frac{7}{2} = \pm\frac{\sqrt{13}}{2}$$
$$x = \frac{7\pm\sqrt{13}}{2}$$





$$\frac{3x^3+2x^2+9x-9}{2x^3-27}$$

$$\frac{2x+3}{x^2-9}$$

How to look for oblique asymptotes.

you will have an oblique asymptote...

when

1) the numerator has a higher degree than the denominator,

and

2) there is no cancellation

then there is an oblique asymptote

$$\frac{x^2+3x-9}{x+5}$$

$$\begin{array}{r|rrr} -5 & 1 & 3 & -9 \\ & & -5 & 10 \\ \hline & 1 & -2 & 1 \end{array}$$

so there is an oblique asymptote at y = x - 2