Graph the following rational functions and name the parts.
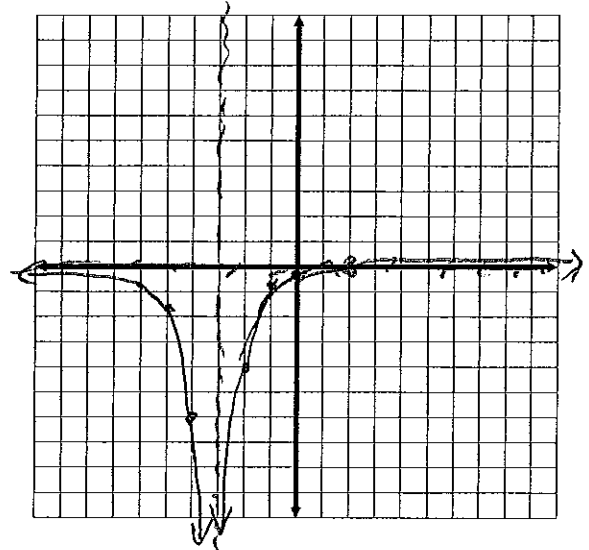
1. $f(x) = \dfrac{x-2}{(x+3)^2}$

domain __$\{x \mid x \neq -3\}$__

vert. asym. __$X = -3$__ horiz. asymp. __$y = 0$__

y-intercept __$\left(0, -\frac{2}{9}\right)$__ x-intercept __$(2,0)$__

slant asymptote __none__ hole(s) __none__

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

$\begin{array}{r|rrr} -1 & 2 & 0 & -1 \\ & & -2 & 2 \\ \hline & 2 & -2 & 4 \end{array}$

$2x - 2$

domain __$\{x \mid x \neq -1\}$__

vert. asym. __$X = -1$__ horiz. asymp. __none__

y-intercept __$(0, -1)$__ x-intercept __$\left(\frac{1}{\sqrt{2}}, 0\right)\left(-\frac{1}{\sqrt{2}}, 0\right)$__

slant asymptote __$y = 2x - 2$__ hole(s) __none__

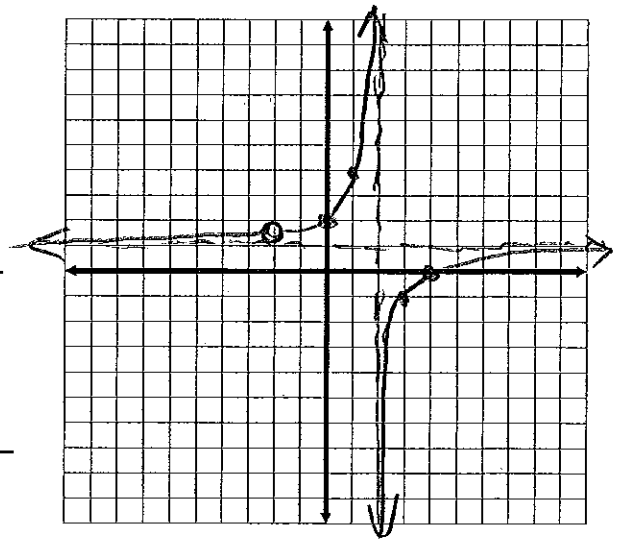~~~~~~
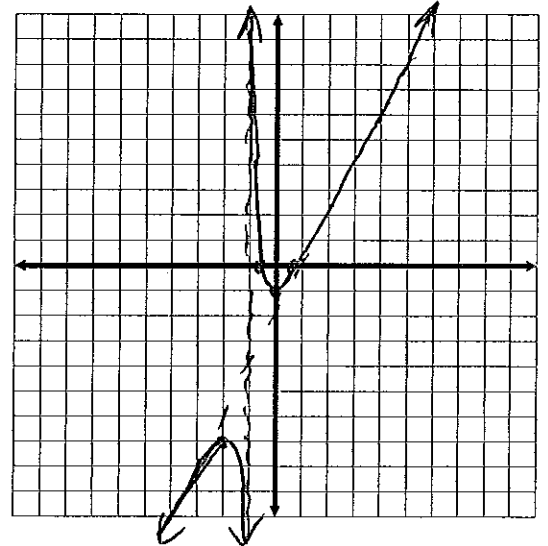
3. $f(x) = \dfrac{x^2 - 2x - 8}{x^2 - 4} = \dfrac{(x-4)(x+2)}{(x-2)(x+2)} = \dfrac{x-4}{x-2}$

domain __$\{x \mid x \neq 2, -2\}$__

vert. asym. __$X = 2$__ horiz. asymp. __$y = 1$__
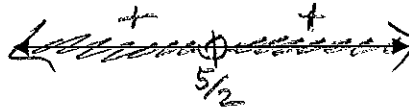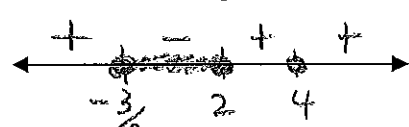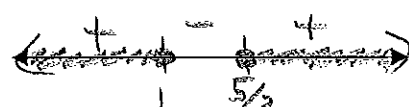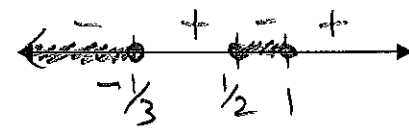
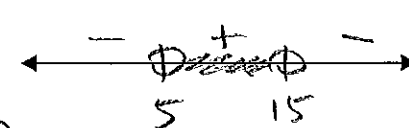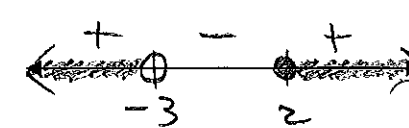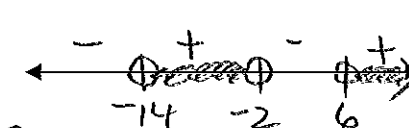y-intercept __$(0, 2)$__ x-intercept __$(4, 0)$__
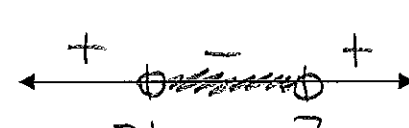
slant asymptote __none__ hole(s) __$\left(-2, \frac{3}{2}\right)$__

Identify the vertical, horizontal and/or slant asymptotes for the following:

4. $f(x)=\dfrac{x}{x^2-1}$ $x=-1, x=1$

     $(x+1)(x-1)$ $y=0$

5. $f(x)=\dfrac{3x^2-8x+4}{2x^2-3x-2}$ $\dfrac{(3x-2)(x-2)}{(2x+1)(x-2)}$ $x=-\frac{1}{2}$ $y=\frac{3}{2}$

6. $f(x)=\dfrac{x^2+5x+8}{x+3}$ $x=-3$

$-3\,|\,1\quad 5\quad 8$
$\quad\quad -3\;-6$
$\overline{\quad 1\quad 2\quad 2}$

   $y=x+2$

7. $f(x)=\dfrac{x^2-2x-8}{x^2-4}$ $\dfrac{(x-4)(x+2)}{(x-2)(x+2)}$ $x=2$ $y=1$

Quadratic, Polynomial, Rational inequalities: Solve the following inequalities. Show your sign graph and express your answers in interval notation.

8. $4x^2-20x+25>0$

$(2x-5)(2x-5)>0$

$\frac{5}{2}\,(2)$

$\left(-\infty,\frac{5}{2}\right)\cup\left(\frac{5}{2},\infty\right)$

9. $(x-4)^2(2x+3)(x-2)\le 0$

$4_{(2)},\ -\frac{3}{2},\ 2$

$\left[-\frac{3}{2},2\right]\cup[4]$

10. $3x^2-8x+5\ge 0$

$(3x-5)(x-1)\ge 0$

$\frac{5}{3},\ 1$

$(-\infty,1]\cup\left[\frac{5}{3},\infty\right)$

11. $6x^3-x^2-4x-1\le 0$

$1\,|\,6\ -1\ -4\ -1$
$\quad\;\; 6\quad 5\quad 1\quad 0$
$6x^2+5x+1$
$(2x+1)(3x+1)\ \frac{1}{2},\ -\frac{1}{3},\ 1$

$\left(-\infty,-\frac{1}{3}\right]\cup\left[\frac{1}{2},1\right]$

12. $\dfrac{x-7}{x+1}<0$

$7,\ -1$

$(-1,7)$

13. $\dfrac{3x-5}{x-5}>4$

$\dfrac{3x-5}{x-5}-4>0$

$\dfrac{3x-5}{x-5}-\dfrac{4x-20}{x-5}>0 \Big\}\ \dfrac{-x+15}{x-5}>0$

$15,5$

$(5,15)$

14. $\dfrac{2(x-2)}{x+3}\ge 0$

$2,\ -3$

$(-\infty,-3)\cup[2,\infty)$

15. $\dfrac{5}{x-6}>\dfrac{3}{x+2}$

$\dfrac{5}{x-6}-\dfrac{3}{x+2}>0$

$\dfrac{5x+10}{(x-6)(x+2)}-\dfrac{3x-18}{(x-6)(x+2)}>0 \Big\}\ \dfrac{2x+28}{(x-6)(x+2)}>0$

$-14,6,-2$

$(-14,-2)\cup(6,\infty)$