Name KEY

Precalculus Unit 3: 3.2 Homework
Rational Function Graphs

For each of the following rational functions, find the domain, the vertical asymptote(s) / hole(s), the horizontal asymptote / slant asymptote, the x-intercept(s), the y-intercept, and draw a sketch. **Provide work to support your answer.**

1. $f(x) = \frac{2x+5}{x+1}$

Domain: $\mathbb{R}, x \neq -1$

x-intercept:

$\frac{2x+5}{x+1} = 0$

$2x+5=0$

$2x=-5$

$x=-5/2$

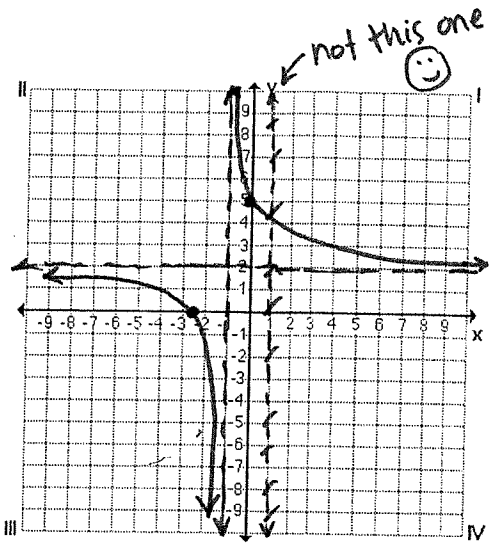
$(-5/2, 0)$

Vertical Asymptote(s):

$x=-1$

Hole:

None



Horizontal Asymptote / Slant Asymptote:

$\frac{\text{Deg}=1}{\text{Deg}=1}$ $y = \frac{2}{1}$ $y=2$

y-intercept: $f(0) = \frac{2(0)+5}{0+1} = 5$

$(0,5)$

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

Domain:

$\mathbb{R}, x \neq -2, x \neq 1$

x-intercept:

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

$2x = 0$

$x = 0$

$(0,0)$

Vertical Asymptote(s):

$x=-2$ $x=1$

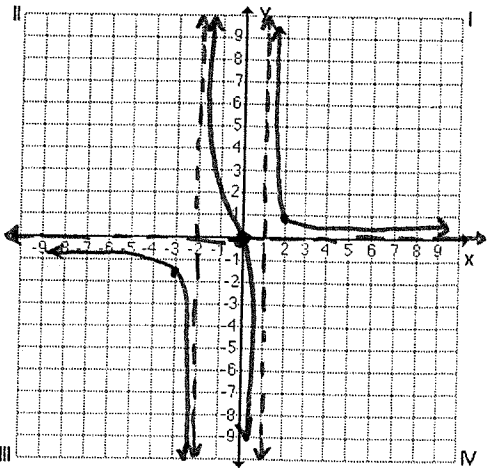
y-intercept:

$f(0) = \frac{2(0)}{0^2+0-2} = 0$

$(0,0)$

Hole:

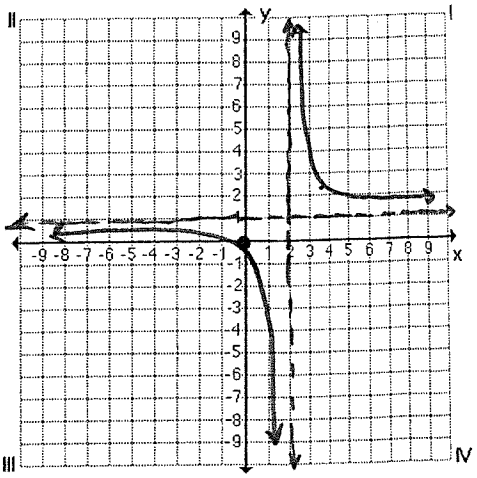
None



Horizontal Asymptote / Slant Asymptote:

$\frac{\text{Deg}=1}{\text{Deg}=2}$ $y=0$

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



Domain:

$\mathbb{R}, x \neq -3, x \neq 2$

x-intercept:

$\frac{x}{x-2} = 0$

$x = 0$

$(0,0)$

Vertical Asymptote(s):

$x = 2$

Hole:

$(-3, \frac{-3}{-5}) = (-3, \frac{3}{5})$

y-intercept:

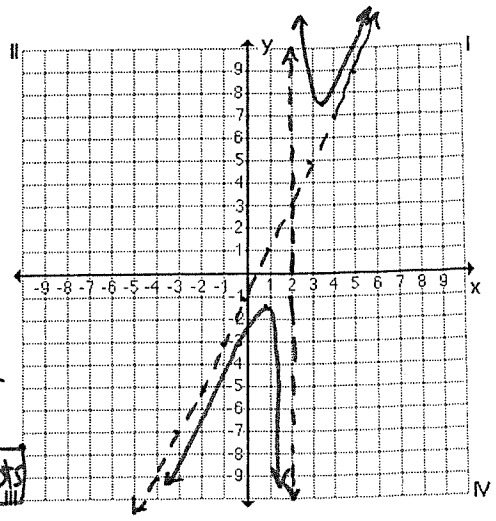
$f(0) = \frac{0^2+3(0)}{0^2+0-6} = \frac{0}{-6} = 0$

$(0,0)$

Horizontal Asymptote / Slant Asymptote:

$\frac{\text{Deg} = 2}{\text{Deg} = 2}$ $y = 1$

4. $f(x) = \frac{2x^2-5x+5}{x-2} =$ doesn't factor $(2x \quad \neq \quad \neq$



Domain: $\mathbb{R}, x \neq 2$

x-intercept:

$\frac{2x^2-5x+5}{x-2} = 0$

Vertical Asymptote(s):

$x = 2$

$x = \frac{5 \pm \sqrt{25-4(2)(5)}}{2(2)}$

Hole:

None

$x = \frac{5 \pm \sqrt{-15}}{4} = \frac{5 \pm i\sqrt{15}}{4}$

no x-intercepts

Horizontal Asymptote / Slant Asymptote:

$\frac{\text{Deg} = 2}{\text{Deg} = 1}$ slant asymptote

y-intercept: $f(0) = \frac{2(0)^2-5(0)+5}{0-2}$

$= \frac{5}{-2} = -\frac{5}{2}$

$(0, -5/2)$

$x-2 \overline{)\, 2x^2-5x+5}$

$2x-1$

$2x^2-2x$

$-x+5$

$y = 2x-1$

5. Write an example of a rational function that has a vertical asymptote at $x = 4$, a hole at $(3, -7)$, and a horizontal asymptote at $y = 2$.

$$f(x) = \frac{(2x+1)(x-3)}{(x-4)(x-3)} = \boxed{\frac{2x^2-5x-3}{x^2-7x+12} = f(x)}$$

6. The concentration C of a chemical in the bloodstream t hours after injection into muscle tissue is given by $C = \frac{3t^2+t}{t^3+50}$, $t \geq 0$.

a.) Determine the horizontal asymptote and interpret its meaning in the context of the problem.

$\frac{\text{Deg} = 2}{\text{Deg} = 3}$ $\boxed{y = 0}$ Concentration cannot = 0 or be negative so there will always be trace amts.

b.) Graph the function on a graphing utility and approximate the time when the concentration is the greatest.

$\boxed{4.5 \text{ hours}}$ 4.486

c.) Use the graphing utility to determine when the concentration is less than 0.345.

$\boxed{\text{before } 2.645 \text{ hours and after } 8.322 \text{ hours}}$