Objective: Rewrite rational functions in the form $f(x) = \frac{a}{x-h} + k$ *or* $f(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ and then graph.

Concept

When given a rational function of the form $g(x) = \frac{mx+n}{px+q}$ where $m \neq 0$ and $p \neq 0$, you can carry out the division of the numerator by the denominator to write the function in the form $g(x) = \frac{a}{x-h} + k$ or $g(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ in order to graph it.

$$g(x) = \frac{2x-5}{x-4} \longrightarrow x-4\overline{)\,2x-5}\;\;2+\frac{3}{x-4} \longrightarrow g(x) = \frac{3}{x-4} + 2$$

$$-\underline{(2x-8)}$$
$$3$$

Objective: Rewrite rational functions in the form $f(x) = \frac{a}{x-h} + k$ *or* $f(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ and then graph.

Concept

Graphing a Simple Rational Function of the Form

$$f(x) = \frac{a}{x-h} + k \text{ or } f(x) = \frac{1}{\frac{1}{b}(x-h)} + k$$

1. Find and graph the vertical asymptote $x = h$ and the horizontal asymptote $y = k$.
2. Identify any stretch, compression, and/or reflection and then transform the points $(1,1)$ and $(-1,-1)$.

   or

   Calculate at least one point on the left side of the vertical asymptote and at least one point on the right side of the vertical asymptote using x values of your choice.
3. Graph the pieces of the curve. Make sure each piece of the curve approaches the asymptotes.

Objective: Rewrite rational functions in the form $f(x) = \frac{a}{x-h} + k$ or $f(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ and then graph.

Ex) Rewrite the function in the form $g(x) = \frac{a}{x-h} + k$ or $g(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ and then graph the function.

$$g(x) = \frac{3x-4}{x-1}$$

① $x-1 \overline{)\,3x-4}$ $\quad 3 + \frac{-1}{x-1}$

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

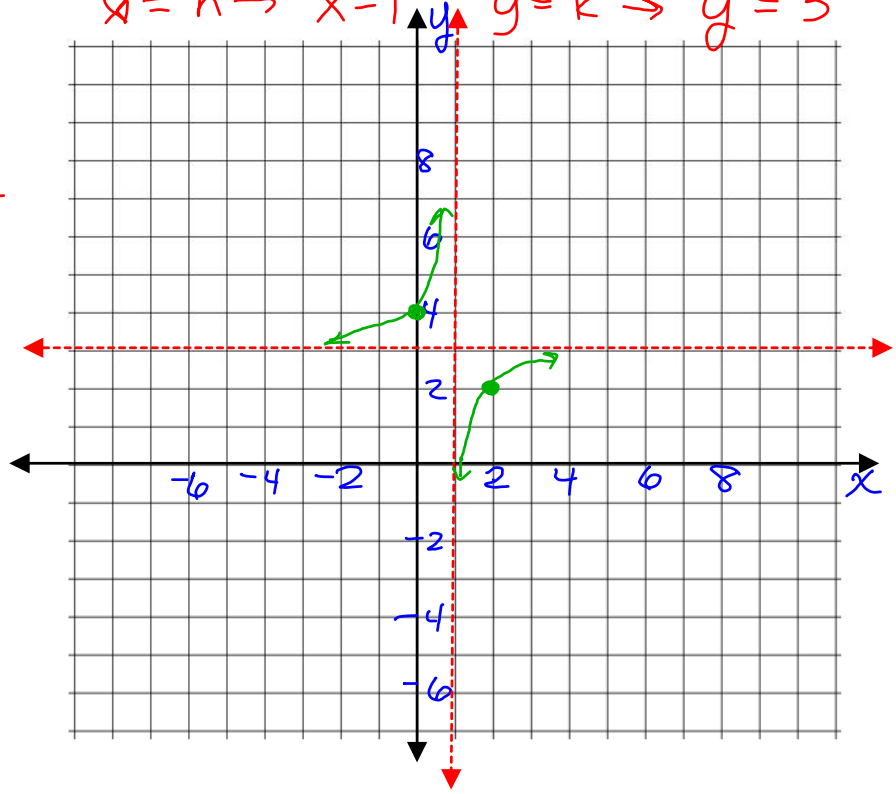
$\quad -1$

$$g(x) = \frac{-1}{x-1} + 3$$

$h = 1 \quad k = 3$

$a = -1$ vert. reflection

② vert. asy. $x = h \rightarrow x = 1$ $\quad$ horiz. asy. $y = k \rightarrow y = 3$



Objective: Rewrite rational functions in the form $f(x) = \frac{a}{x-h} + k$ or $f(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ and then graph.

Ex) Rewrite the function in the form $g(x) = \frac{a}{x-h} + k$ or $g(x) = \frac{1}{\frac{1}{b}(x-h)} + k$ and then graph the function.

$$g(x) = \frac{4x-7}{-2x+4}$$

① $-2 + \frac{1}{-2x+4}$

$-2x+4 \overline{)\,4x-7}$

$+(-4x+8)$

1

$-2(-2x+4)$

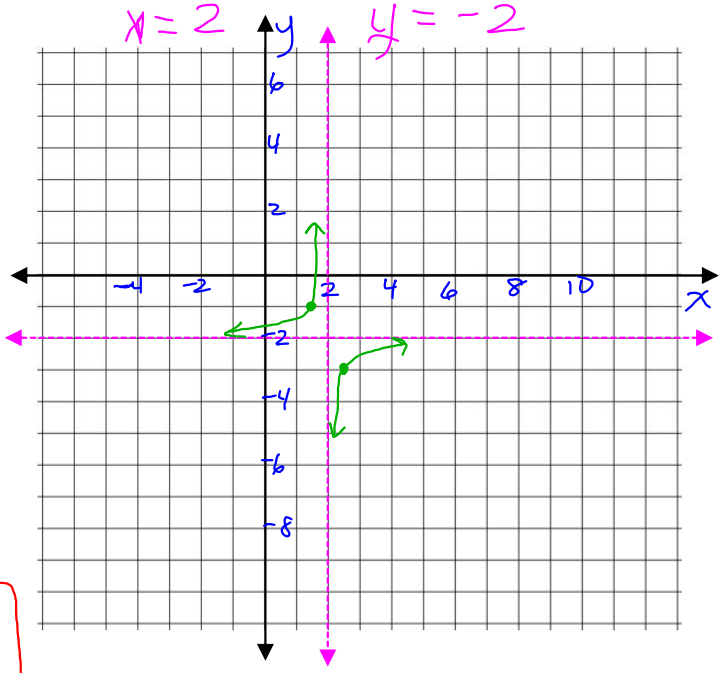
$g(x) = \frac{1}{-2x+4} + -2$

factor

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

$\frac{1}{b} = -2 \quad h = 2 \quad k = -2$

② vert. asy. $x = 2$ hor. asy. $y = -2$



$b = \frac{-1}{2}$ horiz. comp.
horiz. refl.