

9.2 Notes: Graphing Rational Functions Day 1

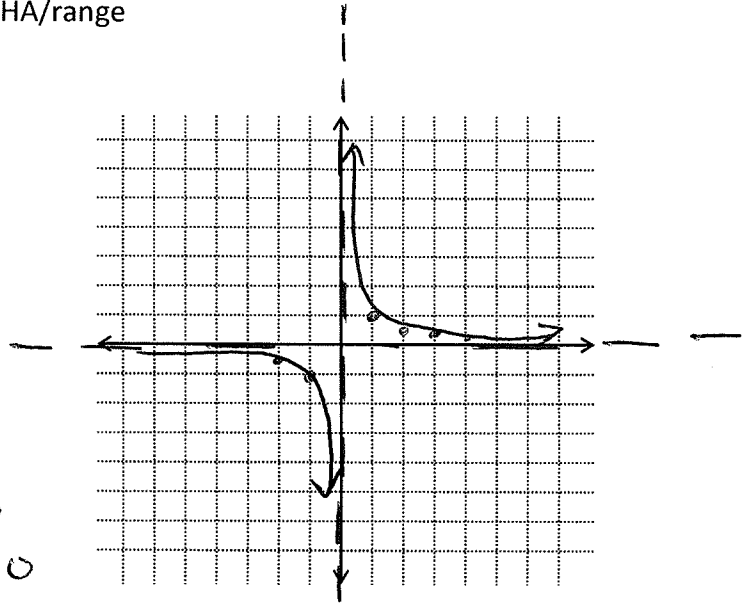
Objectives:

- Be able to graph basic rational function...no shift, VA/domain, HA/range
- Be able to recognize and graph basic rational functions using transformations; know and understand how they affect VA/domain and HA/range

① $f(x) = \frac{1}{x}$

Make a table of values:

x	-2	-1	0	1	2	3	4
y	$-\frac{1}{2}$	-1	undef	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$



Sketch the graph:

Vertical Asy: $x=0$
Horizontal Asy: $y=0$

All basic rational functions will have this same basic shape, but transformations can be applied to this rational function just like absolute value functions, quadratic functions, cubic functions, etc.

Use your previous knowledge to guess the transformation and sketch the graph of the following functions. Be sure to include the asymptotes.

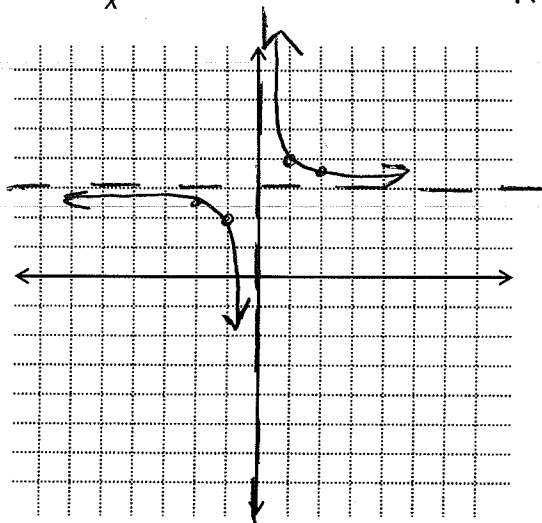
parent: $f(x) = \frac{1}{x}$

$f(x) = \frac{a}{x-h} + k$

Annotations:
 - a : vertical stretch/shrink
 - h : horiz shift
 - k : vertical shift

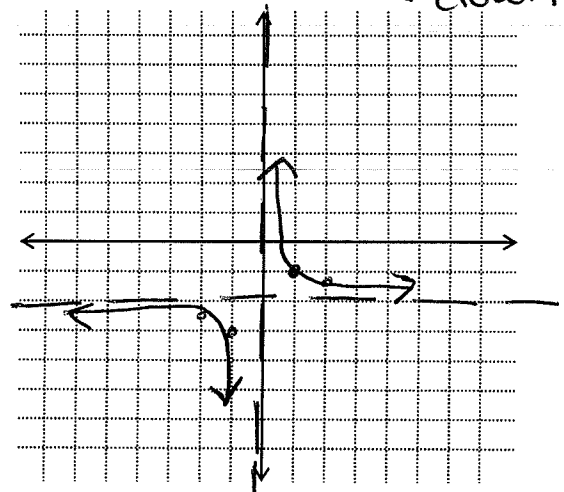
② $f(x) = \frac{1}{x} + 3$

up 3



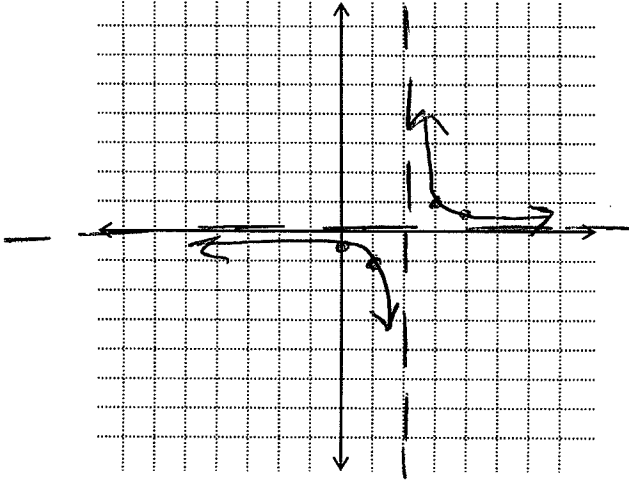
3. $f(x) = \frac{1}{x} - 2$

Annotations:
 - parent: $f(x) = \frac{1}{x}$
 - down 2



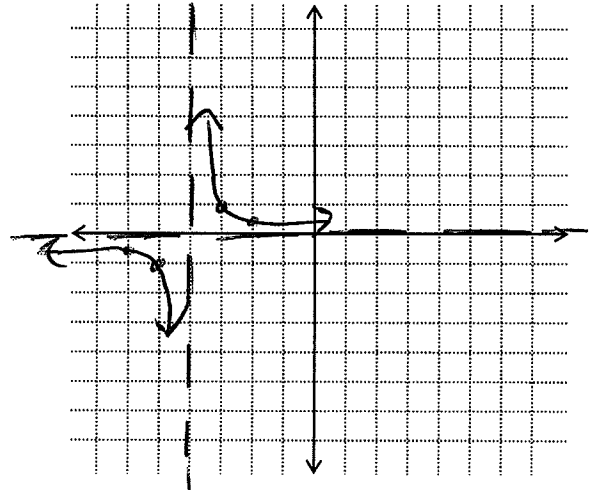
right 2

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

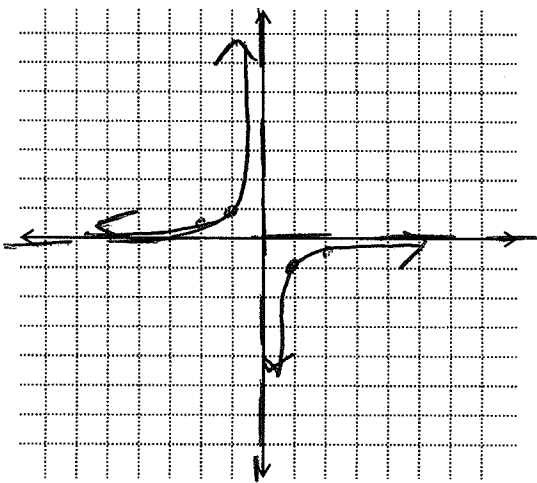


left 4

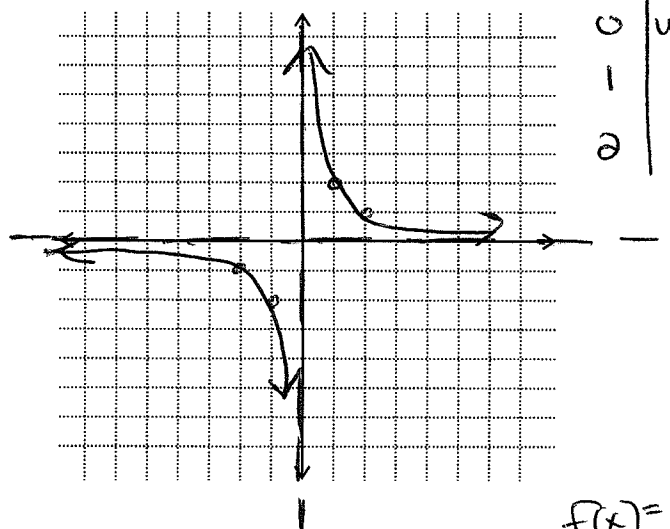
5. $f(x) = \frac{1}{x+4}$



6. $f(x) = \frac{-1}{x}$ reflection over x-axis

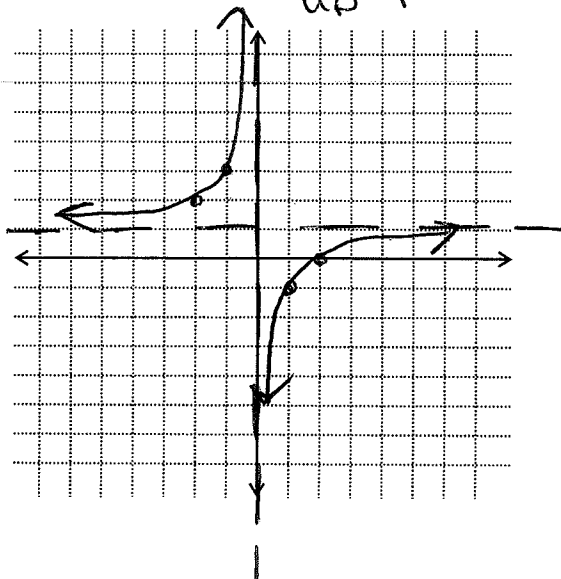


7. $f(x) = \frac{2}{x}$ vertical stretch

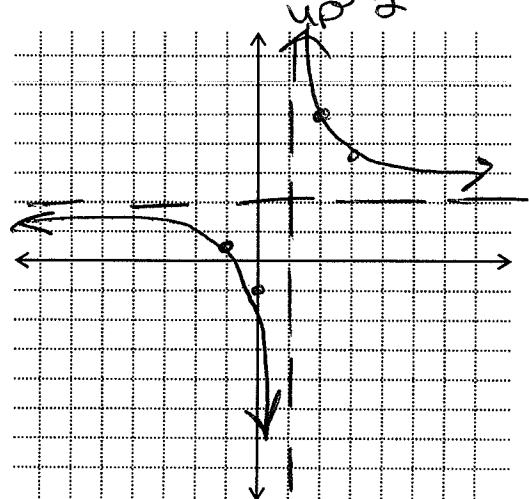


x	y
-2	-1
-1	-2
0	unde
1	2
2	1

8. $f(x) = \frac{-2}{x} + 1$ reflection vertical stretch up 1



9. $f(x) = \frac{3}{x-1} + 2$ vertical stretch right 1 up 2



$f(x) = \frac{3}{x}$

x	y
-2	-1.5
-1	-3
0	unde
1	3
2	1.5

List all of the key information without graphing each function.

10. $f(x) = \frac{4}{x-1} + 2$

Vertical asymptote: $x=1$

Horizontal asymptote: $y=2$

Reflected? no

Domain: $(-\infty, 1) \cup (1, \infty)$

Range: $(-\infty, 2) \cup (2, \infty)$

y-intercept: $(0, -2)$

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

11. $f(x) = \frac{-1}{x-4} - 3$

Vertical asymptote: $x=4$

Horizontal asymptote: $y=-3$

Reflected? yes

Domain: $(-\infty, 4) \cup (4, \infty)$

Range: $(-\infty, -3) \cup (-3, \infty)$

y-intercept: $(0, 1)$

$$y = \frac{-1}{0-4} - 3 = 4 - 3 = 1$$

12. $f(x) = \frac{2}{x+1} - 4$

Vertical asymptote: $x=-1$

Horizontal asymptote: $y=-4$

Reflected? no

Domain: $(-\infty, -1) \cup (-1, \infty)$

Range: $(-\infty, -4) \cup (-4, \infty)$

y-intercept: $(0, -2)$

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

13. $f(x) = -\frac{3}{x-2}$

Vertical asymptote: $x=2$

Horizontal asymptote: $y=0$

Reflected? yes

Domain: $(-\infty, 2) \cup (2, \infty)$

Range: $(-\infty, 0) \cup (0, \infty)$

y-intercept: $(0, 1.5)$

$$y = -\frac{3}{0-2} = -(-1.5) = 1.5$$