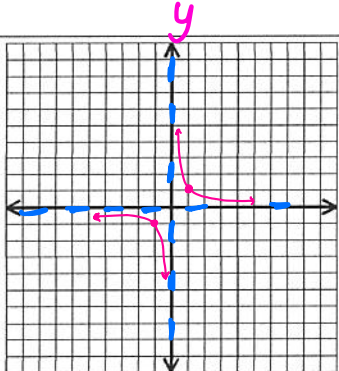
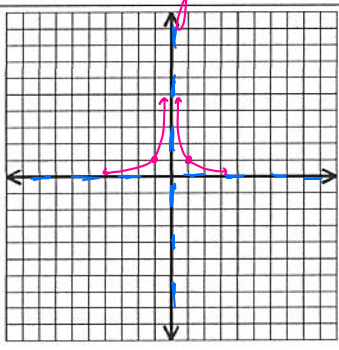


More Parent Functions

Function	Key Characteristics	Domain and Range	Graph
Hyperbola Equation: $f(x) = \frac{1}{x}$ bk at $x=0$ this function is undefined	$(1, 1)$ $(-1, -1)$ x-intercept: $0 = \frac{1}{x}$ $0 \neq 1$ no y-intercept: $y = \frac{1}{0}$ no y-intercept Vertical Asymptote: $x = 0$ Horizontal Asymptote: $y = 0$	$D: (-\infty, 0) \cup (0, \infty)$ or $\{x x \neq 0\}$ $R: (-\infty, 0) \cup (0, \infty)$ or $\{y y \neq 0\}$	 <p style="text-align: right; color: pink;">x</p> <p style="text-align: right; color: pink;">odd</p>
"Volcano" Equation: $f(x) = \frac{1}{x^2}$ $x^2 = 0$ $x = 0$	$(1, 1)$ $(-1, 1)$ x-intercept: $0 = \frac{1}{x^2}$ $0 \neq 1$ no y-intercept: none Vertical Asymptote: $x = 0$ Horizontal Asymptote: $y = 0$	$D: (-\infty, 0) \cup (0, \infty)$ or $\{x x \neq 0\}$ $R: (0, \infty)$ or $\{y y > 0\}$	 <p style="text-align: right; color: pink;">x</p> <p style="text-align: right; color: pink;">even</p>

Remember These?

Transformation Rules

- $f(x) + a$ is $f(x)$ shifted upward a units
- $f(x) - a$ is $f(x)$ shifted downward a units
- $f(x + a)$ is $f(x)$ shifted left a units
- $f(x - a)$ is $f(x)$ shifted right a units
- $-f(x)$ is $f(x)$ flipped upside down ("reflected about the x -axis")
- $f(-x)$ is the mirror of $f(x)$ ("reflected about the y -axis")

Name: _____

Date: _____

PC: Hyperbolas and Volcanoes

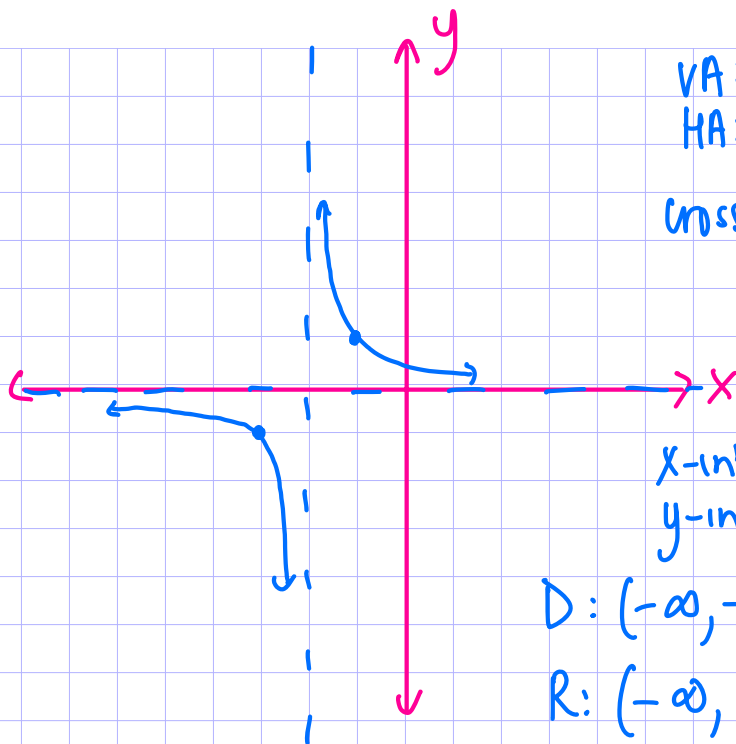
Sketch each function using a minimum of 2 points and including any and all asymptotes.
For each graph, state the domain, range, intercepts and equations of any asymptotes.

1. $y = \frac{1}{x+2}$

parent function: $\frac{1}{x}$
left 2

VA: $x+2=0$
 $x=-2$

$(1, 1)$ $(-1, 1)$
 $(-1, -1)$ $(-3, -1)$



VA: $x = -2$
HA: $y = 0$
cross? no
 $\frac{1}{x+2} = 0$

X-int: none
y-int: $(0, \frac{1}{2})$

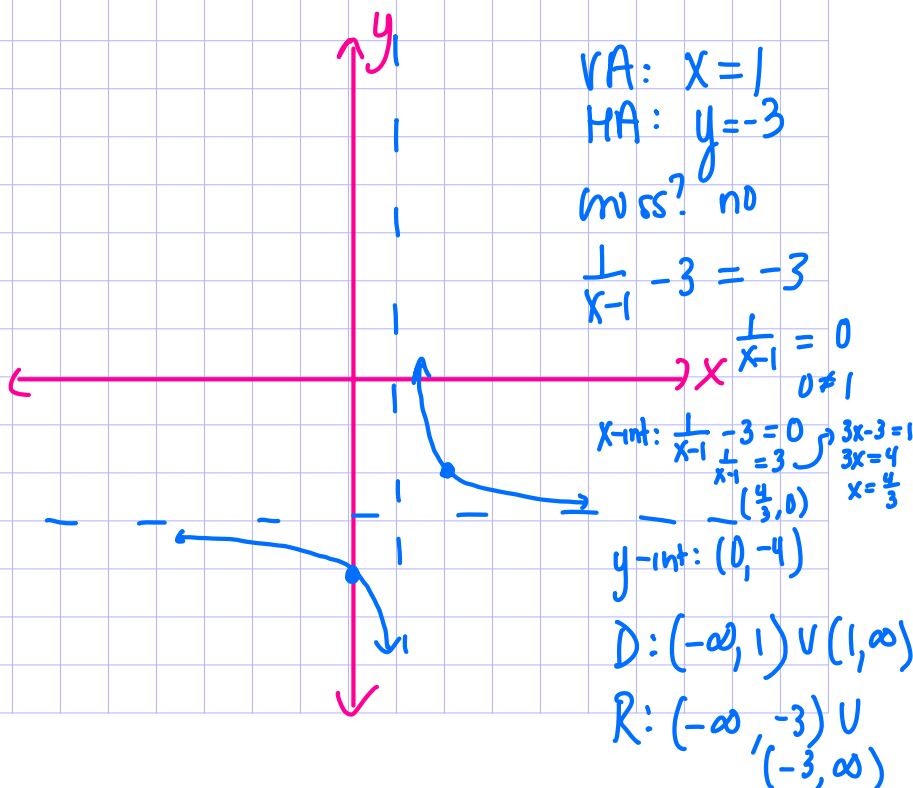
D: $(-\infty, -2) \cup (-2, \infty)$

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

3. $y = \frac{1}{x-1} - 3$

parent function: $\frac{1}{x}$
moved right 1 \downarrow 3

$(1, 1)$ $(2, 1)$ $(2, -2)$
 $(-1, -1)$ $(0, -1)$ $(0, -4)$



VA: $x = 1$
HA: $y = -3$
cross? no
 $\frac{1}{x-1} - 3 = -3$
 $\frac{1}{x-1} = 0$
 $0 \neq 1$

X-int: $\frac{1}{x-1} - 3 = 0$
 $\frac{1}{x-1} = 3$
 $3x-3=1$
 $3x=4$
 $x = \frac{4}{3}$
y-int: $(0, -4)$

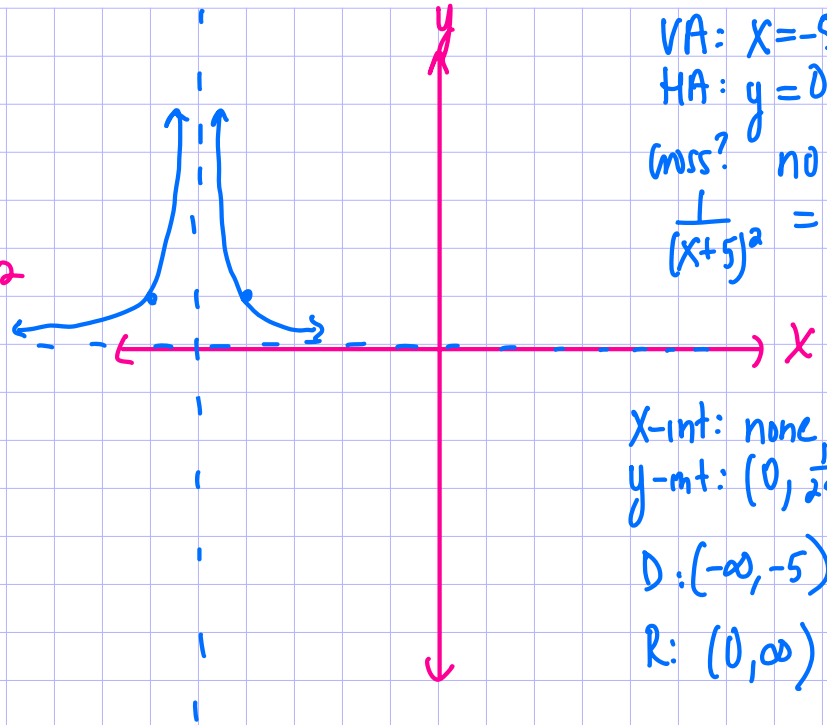
D: $(-\infty, 1) \cup (1, \infty)$

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

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

parent function: $y = \frac{1}{x^2}$
left 5

- $(-1, 1)$ $(-6, 1)$
- $(1, 1)$ $(-4, 1)$



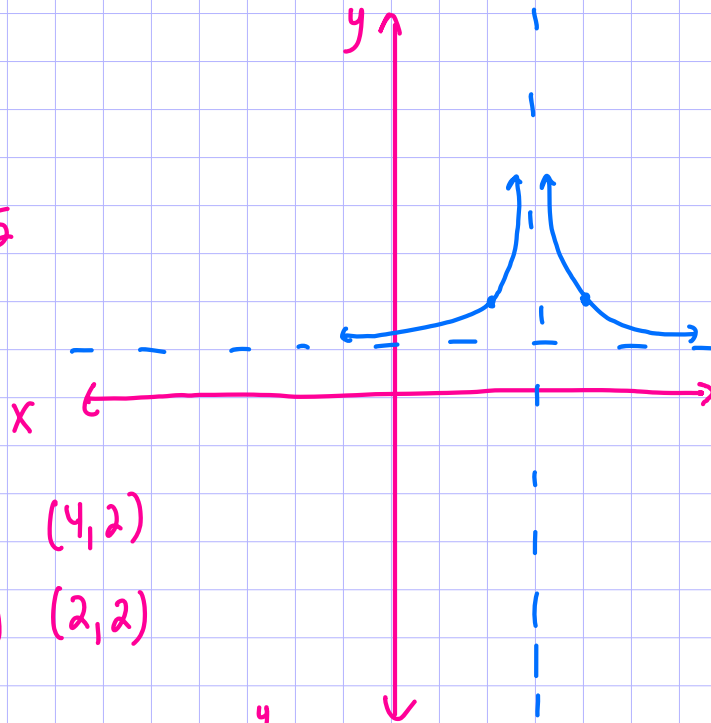
VA: $x = -5$
HA: $y = 0$
Cross? no
 $\frac{1}{(x+5)^2} = 0$

X-int: none
y-int: $(0, \frac{1}{25})$
D: $(-\infty, -5) \cup (-5, \infty)$
R: $(0, \infty)$

7. $y = \frac{1}{(x-3)^2} + 1$

parent function: $\frac{1}{x^2}$
right 3 ↑ 1

- $(1, 1)$ $(4, 1)$ $(4, 2)$
- $(-1, 1)$ $(2, 1)$ $(2, 2)$

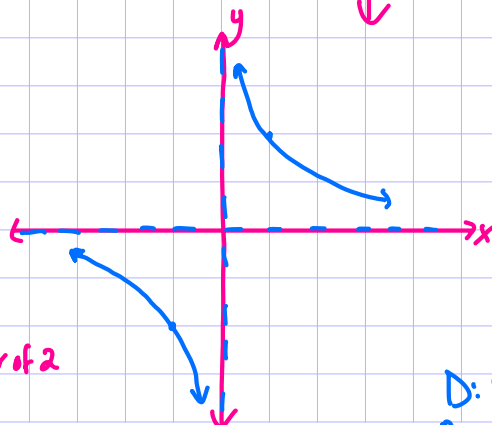


VA: $x = 3$
HA: $y = 1$
Cross? no
 $\frac{1}{(x-3)^2} + 1 = 1$
 $\frac{1}{(x-3)^2} = 0$
X-int: none
y-int: $(0, \frac{10}{9})$
D: $\{x | x \neq 3\}$
R: $(1, \infty)$

9. $y = \frac{2}{x} = 2 \cdot \frac{1}{x}$

parent function: $\frac{1}{x}$
Vertical stretch by a factor of 2

- $(1, 1)$ $(1, 2)$
- $(-1, -1)$ $(-1, -2)$



VA: $x = 0$
HA: $y = 0$
Cross? no
 $\frac{2}{x} = 0$
X-int: none
y-int: none
D: $\{x | x \neq 0\}$
R: $\{y | y \neq 0\}$