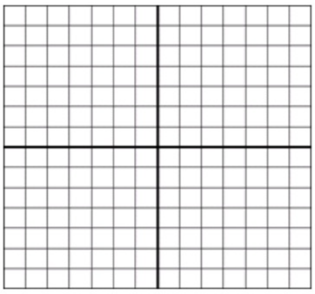
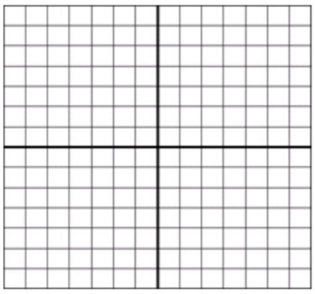
Determine the domain of the following functions. Draw a sketch of the graph.

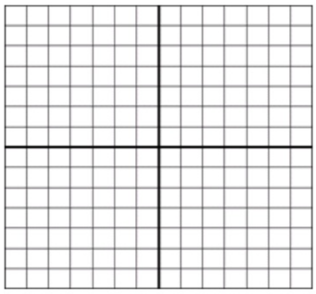
1. $y = \frac{1}{x}$

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

3. $y = \frac{x^2 - 4}{x-2}$







Discontinuities

Holes
(removable discontinuity)

- occur when there is a value of x that makes the denominator equal to zero, but we can cancel out the factor

1. Set the canceled factor equal to 0.
2. Solve for x.
3. Plug the answer into the simplified equation to get *y*.
4. (x, y) is the hole

Examples of functions with holes:

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

2. $g(x) = \dfrac{x+3}{x^2-2x-15}$

Vertical Asymptotes
(non-removable discontinuity)

- occur when there is a value of x that would make the denominator equal to zero, but we can't get rid of the factor

Examples of functions with vertical asymptotes:

1. $y = \frac{x}{2x-6}$

2. $y = \frac{10}{x^2-4}$

3. $y = \frac{x+5}{x^3+5x^2+6x}$

Horizontal Asymptote – occur in 2 out of the 3 cases

- to find a horizontal asymptote, examine what happens to the function as x approaches infinity

Conclusion (short cut)

Case 1: → Denominator exponent is larger/higher

Case 2: → Exponents are equal

Case 3: → Numerator exponent is larger/higher

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

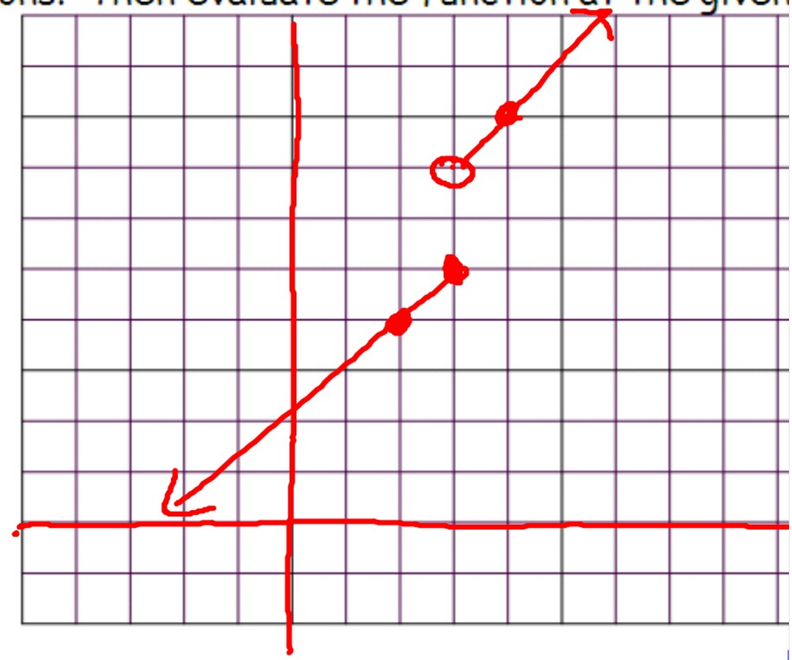
2. $y = \frac{5x^2 + 4x}{x^2 - 7}$

3. $y = \frac{x^3 - 2}{x^2 - 4}$

raphing and Evaluating Piecewise Functions Block ____________Date __

lot the following piecewise functions. Then evaluate the function at the given

) $f(x)=\begin{cases} x+2 & if\ x \le 3 \\ x+4 & if\ x > 3 \end{cases}$



$f(0) =$ 2

$f(3) =$ 5

$f(-2) =$ 0

$$f(x) = \begin{cases} x^2 & if\ x > 1 \\ 2 & if\ x \le 1 \end{cases}$$

) = 2

) = 9

2) = 2

$$f(x)=\begin{cases} 2 & if \quad x \le -1 \\ -x+1 & if \quad -1 < x < 1 \\ \frac{1}{2}x-\frac{1}{2} & if \quad x \ge 1 \end{cases}$$

0) = 1 $\qquad$ $f(3) = 1$

.) = 0 $\qquad$ $f\left(\frac{1}{2}\right) = \frac{1}{2}$

-1) = 2 $\qquad$ $f(-2) = 2$