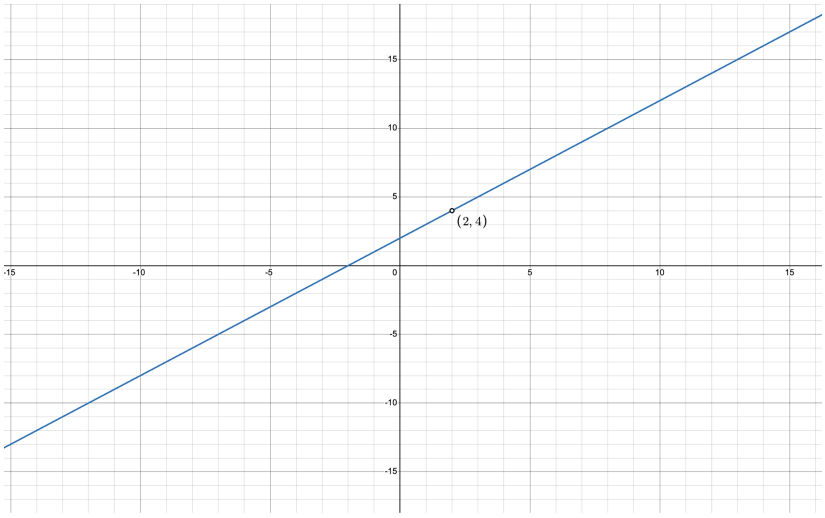
Rational Functions' Domains

Name: _____Answer Key_____ Date: _____

1. Graph the rational function $y = \frac{x^2 - 4}{x - 2}$, note that you can factor the numerator to (x-2)(x+2). State the domain of the function; be able to explain your domain selection. (Think about this carefully!)

Domain: (-∞, 2) ∪ (2, ∞)

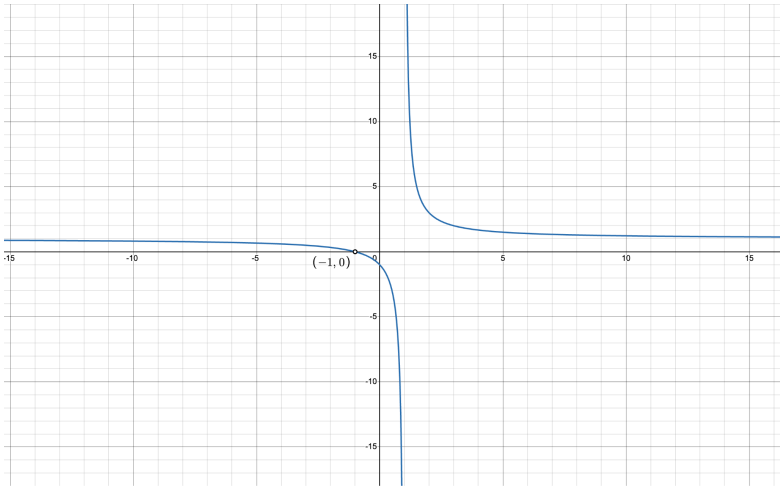
Graph:



2. Graph the rational function $y = \frac{x^2 + 2x + 1}{x^2 - 1}$. Note that it might be helpful to factor the numerator and denominator for this function. State the domain of the function; be able to explain your domain selection.

Domain: (-∞, -1) ∪ (-1, 1) ∪ (1, ∞)

Graph:



3. Play around with Desmos to determine a function that has a vertical asymptote at x = 0 and a hole at x = 2. State the equation, its domain, and draw the graph of the function below.

Equation:

Domain:

Graph:

Different answers are possible here.

4. Short answer. Determine if the graph of each function has a vertical asymptote, a hole, both, or neither. You may use Desmos, but also consider the domains for each.

a) $y = \frac{x+3}{x^2-9}$ both vertical asymptote and hole; domain: (-∞, -3) ∪ (-3, 3) ∪ (3, ∞)

b) $y = \frac{(x+3)^2}{x-4}$ vertical asymptote only; domain: (-∞, 4) ∪ (4, ∞)

c) $y = \frac{x-2}{x^2+x-6}$ both vertical asymptote and hole; domain: $(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$

5. Explain when a rational function has a vertical asymptote and when it has a hole.

Different responses will be acceptable here.