Graphing Rational Functions

Name **ANSWERS**

1. Given the rational expressions: $\frac{x^2-9}{x-3}$ and $x+3$

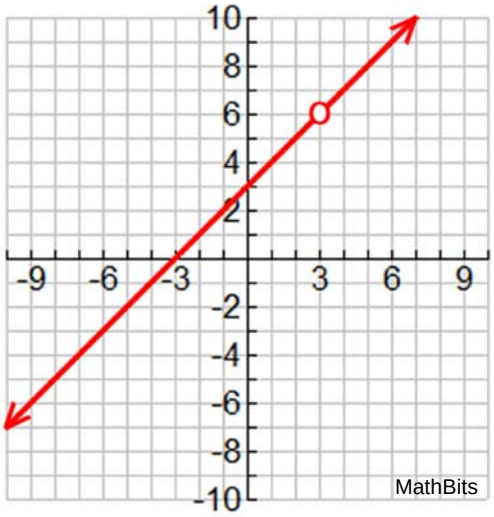
a) Complete the table at the right.

x	$\frac{x^2-9}{x-3}$	$x+3$
-2	1	1
0	3	3
1	4	4
3	undefined	6
4	7	7
9	12	12

b) Simplify the expression: $\frac{x^2-9}{x-3}$ $\frac{(x+3)\cancel{(x-3)}}{\cancel{(x-3)}} = x+3$

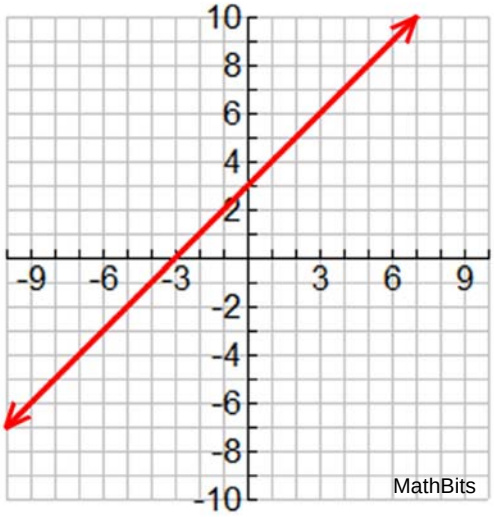
c) Graph .

State the domain: $x \neq 3$



d) Graph $g(x) = x+3$.

State the domain: All Reals



e) Based upon your findings, would you say that $\frac{x^2-9}{x-3}$ is equivalent to $x+3$? Explain.

No. While the first expressions can be simplified algebraically to produce the second expressions, the expressions are not entirely equivalent. The first expression is undefined when $x = 3$, which is not a restriction needed on the second expression.

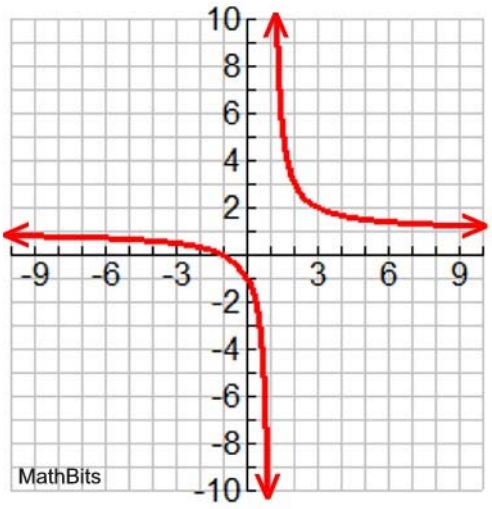
2. Given $g(x) = \frac{x+1}{x-1}$.

a) Find the x-intercept(s). Set $x + 1 = 0$. $x = -1$ or (-1,0)

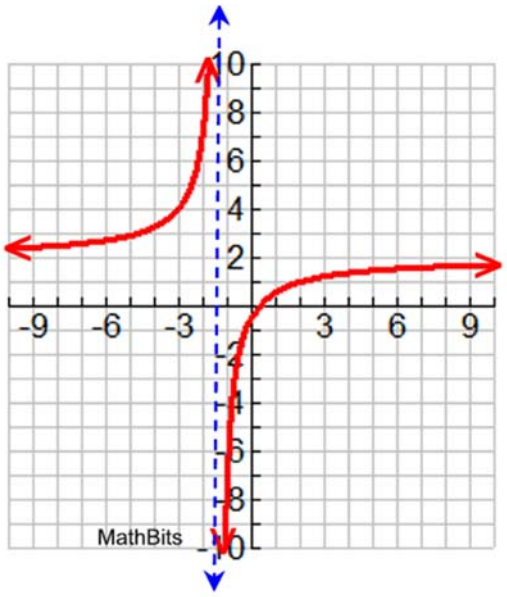
b) Find the y-intercept. Set $x = 0$. (0,-1)

c) State the domain of $g(x)$. All Real – {-1}

d) Graph $g(x)$.



3. Given $f(x) = \dfrac{6x-2}{3x+4}$.



a) Find the *x*-intercept. $x = 1/3$ or $(1/3,0)$

b) Find the *y*-intercept. $(0,-1/2)$

c) Draw a vertical dotted line at the *x*-value where the function is undefined, and state the equation of the line.
$x = -4/3$

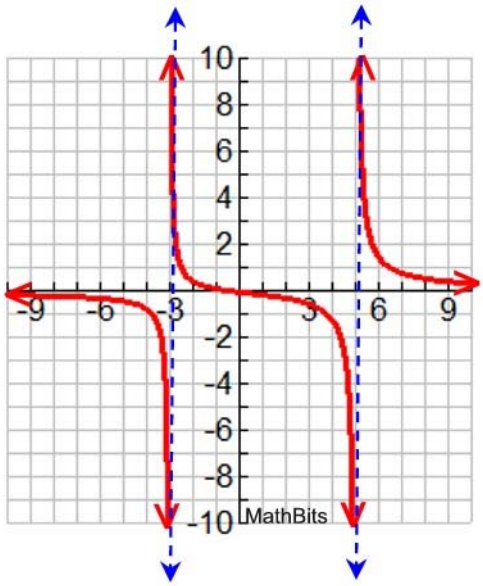
d) Graph $f(x)$.

e) There is a horizontal line (asymptote) which this graph approaches. What is its equation? $y = 2$

f) State the end behavior as $x \to \infty$. $f(x) \to 2$

g) State the end behavior as $x \to -\infty$. $f(x) \to 2$

4. Given $h(x) = \dfrac{2x+1}{x^2-2x-15}$.



a) Find the *x*-intercept. $x = -1/2$ or $(-1/2,0)$

b) Find the *y*-intercept. $(0, -1/15)$

c) Draw a vertical dotted line at the *x*-value(s) where the function is undefined, and state the equation(s) of the line(s).
$x = -3$, $x = 5$

d) Graph $f(x)$.

e) There is a horizontal line (asymptote) which this graph approaches. What is its equation? $y = 0$

f) State the end behavior as $x \to \infty$. $f(x) \to 0$

g) State the end behavior as $x \to -\infty$. $f(x) \to 0$

5. Which rational function has end behavior as $x \to \infty$, $f(x) \to 1$ and as $x \to -\infty$, $f(x) \to 1$?

1) $f(x) = \dfrac{1}{x+2}$ **2)** $g(x) = \dfrac{x^2-1}{x-1}$ **3)** $h(x) = \dfrac{x+2}{x-3}$ **4)** $r(x) = \dfrac{x-2}{x^2-3x-4}$