UNIT 4 - LESSON 2

READY, SET, GO! **Name** **Period** **Date**

READY

Topic: Connecting the zeroes of a polynomial with the domain of a rational function

Find the zeroes of each polynomial.

1. $p(x) = (x+4)(x-2)(x-7)$

   $x = -4, 2, 7$

2. $p(x) = (2x-6)(8x-1)(x-5)$

   $x = 3, 1/8, 5$

3. $p(x) = (9x+3)(x^2-9)$

   $x = -\frac{1}{3}, -3, 3$

4. $p(x) = x^2 + 25$

   $x = 5i, -5i$

*Can write as: 5) All R except $x = -4, 2, 7$

Find the domain of each of the rational functions.

5. $q(x) = \frac{1}{(x+4)(x-2)(x-7)}$

   x-values that make denom. = 0
   $-4, 2, 7$
   D: $(-\infty, -4) \cup (-4, 2) \cup (2, 7) \cup (7, \infty)$

6. $q(x) = \frac{1}{(2x-6)(8x-1)(x-5)}$

   x-values that make denom. = 0
   $x = 1/8,\ x = 3,\ x = 5$
   D: $(-\infty, \frac{1}{8}) \cup (\frac{1}{8}, 3) \cup (3, 5) \cup (5, \infty)$

7. $q(x) = \frac{1}{(9x+3)(x^2-9)}$

   x-values that make denom. = 0
   $-3, -1/3, 3$
   D: $(-\infty, -3) \cup (-3, -1/3) \cup (-\frac{1}{3}, 3) \cup (3, \infty)$

8. $q(x) = \frac{1}{x^2+25}$

   x-values that make denom. = 0
   $x = \pm 5i$ ∴ All R work
   D: $(-\infty, \infty)$

SET

Topic: Practicing transformations on rational functions

Identify the vertical asymptote, horizontal asymptote, domain, and range of each function. Then sketch the graph on the grids provided. (Grids on next page.)

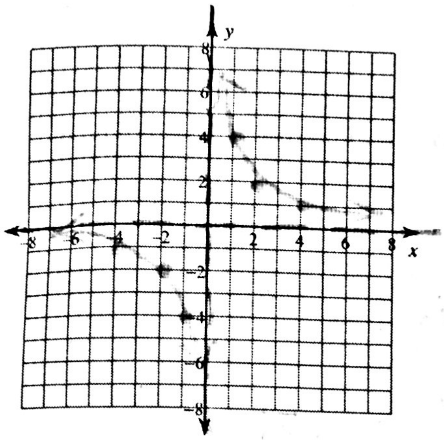
9. $f(x) = \frac{4}{x}$

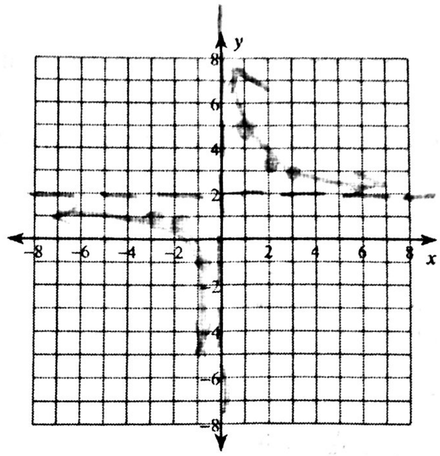
   V.A. $x = 0$ H.A. $y = 0$
   Domain: $(-\infty, 0) \cup (0, \infty)$ Range: $(-\infty, 0) \cup (0, \infty)$

10. $f(x) = \frac{3}{x} + 2$

   V.A. $x = 0$ H.A. $y = 2$
   Domain: $(-\infty, 0) \cup (0, \infty)$ Range: $(-\infty, 2) \cup (2, \infty)$

Need help? Visit **www.rsgsupport.org**





11. $f(x) = -\frac{5}{x-3}$

V.A. $x=3$ H. A. $y=0$

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

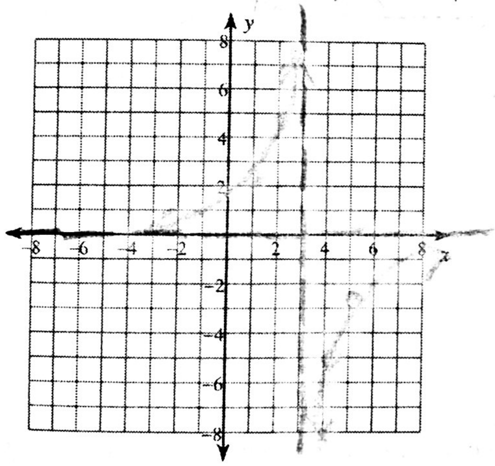
Range: $(-\infty,0)\cup(0,\infty)$

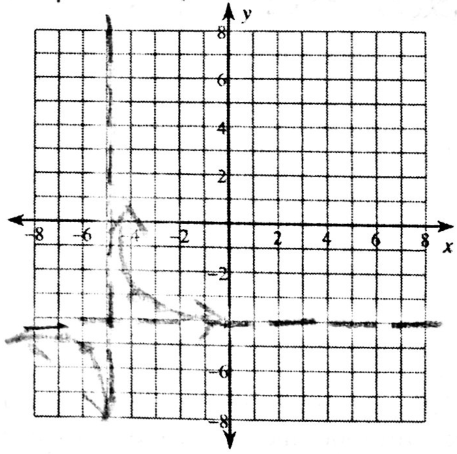
12. $f(x) = \frac{1}{(x+5)} - 4$

V.A. $x=-5$ H. A. $y=-4$

Domain: $(-\infty,-5)\cup(-5,\infty)$

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





13. Write a function of the form $f(x) = \frac{a}{x-h} + k$ with a vertical asymptote at $x = -15$ and a horizontal asymptote at $y = -6$.

$f(x) = \frac{1}{x+15} - 6$

* Other values of "a" can be used ($a \neq 0$)

GO

Topic: Finding the roots and factors of a polynomial

Use the given root to find the remaining roots. Then write the function in factored form.

14. $f(x) = x^3 - x^2 - 17x - 15$ $x^2 - 2x - 15$ $(x+1)\overline{)x^3 - x^2 - 17x - 15}$ $+(-x^3 - x^2)$ $-2x^2 - 17x - 15$ $+(+2x^2 + 2x)$ $-15x - 15$ $+(+15x + 15)$ $x^2 - 2x - 15 = (x-5)(x+3)$ $f(x) = (x+1)(x-5)(x+3)$	$x = -1$ $x = 5$ $x = -3$	15. $f(x) = x^3 - 3x^2 - 61x + 63$ $x^2 - 2x - 63$ $(x-1)\overline{)x^3 - 3x^2 - 61x + 63}$ $+(-x^3 + x^2)$ $-2x^2 - 61x + 63$ $+(+2x^2 - 2x)$ $-63x + 63$ $+(+63x - 63)$ $x^2 - 2x - 63 = (x-9)(x+7)$ $f(x) = (x-1)(x-9)(x+7)$	$x = 1$ $x = 9$ $x = -7$
16. $f(x) = 6x^3 - 18x^2 - 60x$ $= 6x(x^2 - 3x - 10)$ $= 6x(x-5)(x+2)$ $f(x) = 6x(x-5)(x+2)$	$x = 0$ $x = 5$ $x = -2$	17. $f(x) = x^3 - 14x^2 + 57x - 72$ $x^2 - 6x + 9$ $(x-8)\overline{)x^3 - 14x^2 + 57x - 72}$ $+(-x^3 + 8x^2)$ $-6x^2 + 57x - 72$ $+(+6x^2 - 48x)$ $9x - 72$ $+(-9x + 72)$ $x^2 - 6x + 9 = (x-3)^2$ $f(x) = (x-8)(x-3)^2$	$x = 8$ $x = 3$ (mult. 2)

18. A relationship exists between the roots of a function and the constant term of the function. Look back at the roots and the constant term in each problem. Make a statement about anything you notice.
- The roots are all factors of the constant
- The product of the roots is the opposite of the constant term