UNIT 4 - LESSON 4

READY SET GO! Name Period Date

READY

Topic: Connecting features of polynomials and rational functions

Find the roots and domain for each function.

1. $f(x) = (x+5)(x-2)(x-7)$

Roots: $x = -5, 2, 7$
Domain: $(-\infty, \infty)$

2. $g(x) = x^2 + 7x + 6$

$g(x) = (x+1)(x+6)$
Roots: $x = -1, -6$
Domain: $(-\infty, \infty)$

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

Roots: None
Domain: $(-\infty, -5) \cup (-5, 2) \cup (2, 7) \cup (7, \infty)$
or All Rs except $x \neq -5, 2, 7$

4. $h(x) = \frac{1}{(x^2+7x+6)}$

Roots: None
Domain: $(-\infty, -6) \cup (-6, -1) \cup (-1, \infty)$
or All Rs except $x \neq -6, -1$

5. Make a conjecture that compares the domain of a polynomial with the domain of the reciprocal of the polynomial. *(Note that the reciprocal of a polynomial is a rational function.)*

Domain of a polynomial is $(-\infty, \infty)$
The domain of the reciprocal will include the roots of the poly

6. Do the roots of the polynomial tell you anything about the graph of the reciprocal of the polynomial? Yes Explain. The roots of the polynomial are not included in the domain of the reciprocal because they make the denominator = 0. The graph of the reciprocal will have vertical asy at the roots of the poly

7. Find the y-intercept for #1 and #2. What is the y-intercept for #3 and #4?

#1: y-int: $(0, 70)$
#2: y-int: $(0, 6)$
Rational is reciprocal of the poly
#3: y-int $(0, 1/70)$
#4 y-int $(0, 1/6)$

SET

Topic: Distinguishing between proper and improper rational functions.

Determine if each of the following is a proper or an improper rational function.

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

Improper

9. $f(x) = x^3 - 5x^2 - 4$

Improper

10. $f(x) = \frac{3x^2 - 2x + 7}{x^5 - 5}$

Proper

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11. $f(x) = \frac{x^3+4x^2+2x}{10x+7}$

Improper

12. $f(x) = \frac{5x^2-4x+4}{7x^5-2x+3}$

Proper

13. Which of the above functions have the following end behavior?

$as\ x \to \infty, f(x) \to 0\ and\ as\ x \to -\infty, f(x) \to 0$

The functions in #10 & #12 (Horizontal Asy $y=0$)

14. Complete the statement:
ALL *proper* rational functions have end behavior that approaches 0 on both ends

Determine if each rational expression is proper or improper. If improper, use long division to rewrite the rational expressions such that $\frac{a(x)}{b(x)} = q(x) + \frac{r(x)}{b(x)}$ where $q(x)$ represents the quotient and $r(x)$ represents the remainder.

Fill * in missing power

15. $\frac{2x^3-7x^2+6}{x-1}$ Improper

$2x^2-5x-5$
$x-1 \overline{)2x^3-7x^2+0x+6}$
$+(2x^3+2x^2)$
$-5x^2+0x+6$
$+(+5x^2+5x)$
$-5x+6$
$+(+5x+5)$

$2x^2-5x-5+\frac{1}{x-1}$

16. $\frac{(x+1)}{(x-2)(x+2)}$ Proper

17. $\frac{x^3-3x^2+5x-1}{x^2-4x+4}$ Improper

$x+1$
$x^2-4x+4 \overline{)x^3-3x^2+5x-1}$
$+(-x^3+4x^2-4x)$
x^2+x-1
$+(-x^2+4x-4)$
$5x-5$

$x+1+\frac{5x-5}{x^2-4x+4}$

* 18. $\frac{x^3-5x+2}{x-10}$ Improper

$x^2+10x+95$
$x-10 \overline{)x^3+0x^2-5x+2}$
$+(-x^3+10x^2)$
$10x^2-5x+2$
$+(-10x^2+100x)$
$95x+2$
$+(-95x+950)$
952

$x^2+10x+95+\frac{952}{x-10}$

GO
Topic: Finding the domain of rational functions that can be reduced

State the domain of the following rational functions.

19. $y = \frac{(x-2)}{(x-2)(x+5)}$ Domain $(-\infty,-5)\cup(-5,2)\cup(2,\infty)$ or all reals except $x \neq -5, 2$

20. $y = \frac{(x+6)}{(x-4)(x+6)}$ Domain $(-\infty,-6)\cup(-6,4)\cup(4,\infty)$ or all reals except $x \neq -6, 4$

21. $y = \frac{(x-7)(x+10)}{(x+10)(x-3)(x-7)}$ Domain $(-\infty,-10)\cup(-10,3)\cup(3,7)\cup(7,\infty)$ or all reals except $x \neq -10, 3, 7$

a) Each of the previous functions has only one vertical asymptote. Write the equation of the vertical asymptote for #19, #20, and #21 below. Cancel out common factors - read the x-values

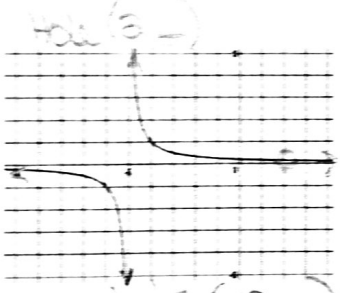
19a) V.A. $x = -5$

20a) V.A. $x = 4$

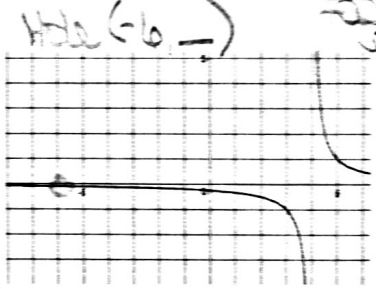
21a) V.A. $x = 3$

b) The graphs of #19, #20, and #21 are below. For each graph, sketch in the vertical asymptote. Put an open circle on the graph anywhere it is undefined. Draw dotted

19b)



20b)



21b)