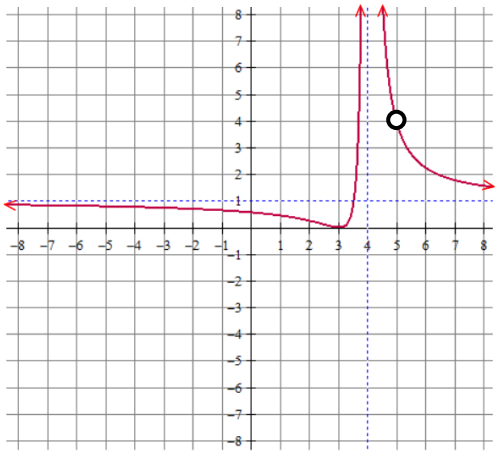
Name: Solutions Date:_____ Period: _____ **1B Review**

Unit 1-B Review – Polynomial and Rational Functions

Reviews do NOT cover all material from the lessons but will hopefully remind you of key points. To be prepared, you must study all packets for lessons 1.7 – 1.14.

Use the graph of the rational function f to answer the following.

1.



a. Find the domain.

$(-\infty, 4) \cup (4,5) \cup (5, \infty)$

b. Find the zero(s).

$x = 3$

c. Find the end behavior of f.

$\lim_{x\to-\infty} f(x) = 1$ $\lim_{x\to\infty} f(x) = 1$

d. Find the limit notation of the vertical asymptote.

$\lim_{x\to4^-} f(x) = \infty$ $\lim_{x\to4^+} f(x) = \infty$

e. Find the limit notation of the hole.

$\lim_{x\to5^-} f(x) = 4$ $\lim_{x\to5^+} f(x) = 4$

Use the rational function to answer the following.

2.

$$g(x) = \frac{x^3 - 2x^2 - 15x}{x^2 + x - 6} = \frac{x(x-5)(x+3)}{(x+3)(x-2)} = \frac{x(x-5)}{x-2}$$

a. Find the domain.

$(-\infty, -3) \cup (-3,2) \cup (2, \infty)$

b. Find the zero(s).

$x = 0$ and 5

c. Find the y-intercept.

$(0,0)$

d. Find the coordinates of hole(s) if there are any.

$g(-3) = \frac{-3(-3-5)}{-3-2}$ $\left(-3, -\frac{24}{5}\right)$

e. Find the vertical asymptote(s) if there are any.

$x = 2$

f. Find the horizontal asymptote if there is one.

none

g. Find the slant asymptote if there is one.

$$\begin{array}{r} x - 3 \\ x^2 + x - 6 \overline{)\, x^3 - 2x^2 - 15x} \\ -(x^3 + x^2 - 6x) \\ \hline -3x^2 - 9x \\ -(-3x^2 - 3x + 18) \\ \hline -6x - 18 \\ R \end{array}$$

$y = x - 3$

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Use the table of the rational function d to find the following.

3.

t	$d(t)$
-3.1	19
-3.01	199
-3.001	1,999
-3.0001	19,999
-3	undefined
-2.9999	$-21{,}111$
-2.999	$-2{,}111$
-2.99	-211
-2.9	-21

a. Find $\lim_{t\to -3^-} d(t) =$ ∞

b. Find $\lim_{t\to -3^+} d(t) =$ $-\infty$

c. As t approaches negative three from the left the $d(t)\ldots$

Approaches infinity

d. As t approaches negative three from the right the $d(t)\ldots$

Approaches negative infinity

Use the binomial theorem to expand the following.

4. $(x+3)^5$

$1(x)^5(3)^0 + 5(x)^4(3)^1 + 10(x)^3(3)^2 + 10(x)^2(3)^3 + 5(x)^1(3)^4 + 1(x)^0(3)^5$

$x^5 + 15x^4 + 90x^3 + 270x^2 + 405x + 243$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1

5. Find the 5th term in $(2x-1)^7$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1

5th term

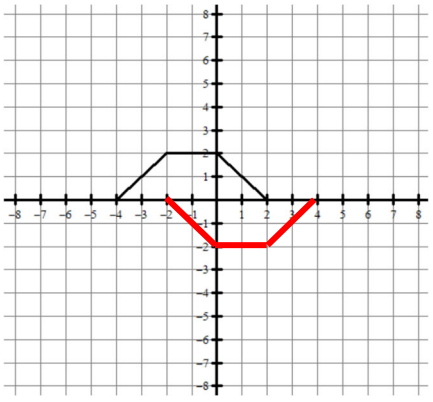
$35(2x)^3(-1)^4$

$35(8x^3)(1)$

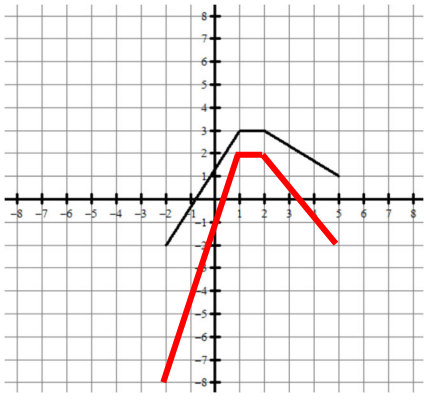
$280x^3$

GRAPHICAL TRANSFORMATIONS. Use the graph of f to graph $g(x)$.

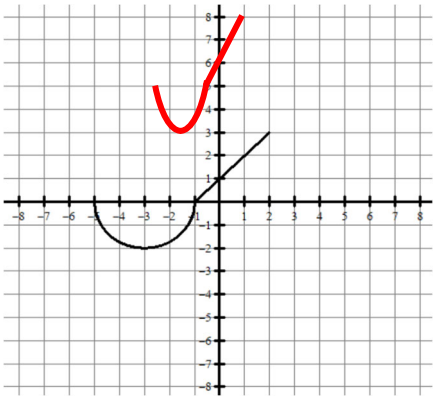
6. $g(x) = -f(x-2)$



7. $g(x) = 2f(x) - 4$



8. $g(x) = f(2x) + 5$



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TRANSFORMATIONS. Use the give information to answer the following.

ALGEBRAICALLY

9. $f(x) = 6 - 4x^2$

$g(x) = f(x) + 5$, find $g(x)$.

$g(x) = [6 - 4x^2] + 5$

$g(x) = 11 - 4x^2$

NUMERICALLY

10.

Given the table of values for f.

x	$f(x)$
-6	2
-3	8
2	15
5	-2
8	-13

Let $g(x) = 3f(x) + 2$, find $g(5)$.

$g(5) = 3f(5) + 2$

$g(5) = 3(-2) + 2$

$g(5) = -4$

DOMAIN and RANGE

11.

Given the graph for f has a domain of $(-5,3)$ and range of $[-4, 8]$.

Let $g(x) = -f(x + 3) - 2$.

Find the domain and range of $g(x)$.

$(-5, 3)$

Shift left 3

$(-8, 0)$

$[-4, 8]$

Reflect vertically

$[4, -8]$

Shift down 2

$[2, -10] \rightarrow [-10, 2]$

CALCULATOR ACTIVE. Graph the data and choose the regression that best fits the data.

12.

x	$f(x)$
14	48
18	50
28	53
33	64
35	70
38	75
41	84
48	105
53	138

a. The data can be modeled by the function f given by $f(x) = ax^2 + bx + c$. Find the value of a, b and c.

$a = 0.073$

$b = -2.753$

$c = 73.845$

a. Use your equation to predict the value of $x = 34$.

65.099

CALCULATOR ACTIVE. Use the model to answer the questions in context.

13. A diver jumps from a cliff into the water below. The function $h(t) = -16t^2 + 14t + 80$ models the height of the diver over time, where t is time in seconds and h is the height in feet.

a. What is the restricted domain in this context?

$[0, 2.72]$

b. What is the restricted range in this context?

$[0, 83.06]$

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Multiple Choice

14. The rational function f is given by $f(x) = \frac{2x^k(x+2)(x-5)}{3x^5-4x^2-2}$, where k is a positive integer. If the function f has a slant asymptote, what is the value of k ?

(A) 2

(B) 3

(C) 4

(D) 5

Slant asymptote means the degree on top is one more than the degree on bottom. Since the degree on bottom is 5, the top must 6.

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15. The rational function g is given by $g(x) = \frac{3x^5-2x^2+9x+5}{x(x-5)^2(x+7)}$. Which of the following describes the end behavior of g ?

x^4

$\lim_{x\to-\infty} g(x) = \frac{-}{+} = -\infty$ $\lim_{x\to\infty} g(x) = \frac{+}{+} = \infty$

(A) As x increases without bound, $g(x)$ increases without bound, and as x decreases without bound, $g(x)$ increases without bound.

(B) As x increases without bound, $g(x)$ increases without bound, and as x decreases without bound, $g(x)$ decreases without bound.

(C) As x increases without bound, $g(x)$ decreases without bound, and as x decreases without bound, $g(x)$ increases without bound.

(D) As x increases without bound, $g(x)$ decreases without bound, and as x decreases without bound, $g(x)$ decreases without bound.

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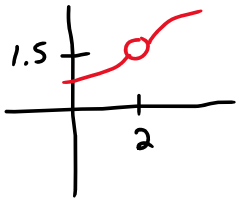
16. The table gives values of $h(x)$ for selected values of x. Which of the following best describes $h(x)$?

x	$h(x)$
1.997	1.489
1.998	1.495
1.999	1.499
2	undefined
2.001	1.501
2.002	1.504
2.003	1.507



(A) The graph of h has a hole at $x = 2$

(B) The graph of h has a vertical asymptote at $x = 2$

(C) The graph of h has a hole at $x = \frac{3}{2}$

(D) The graph of h has a vertical asymptote at $x = \frac{3}{2}$

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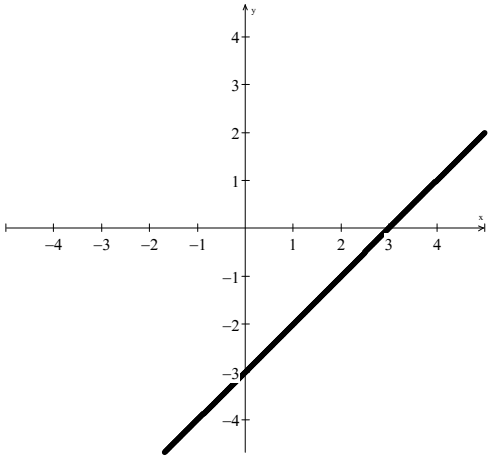
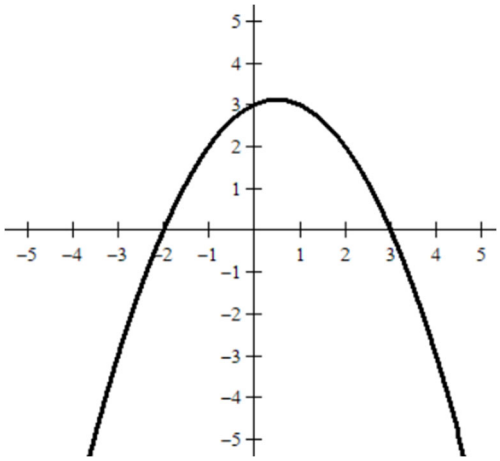
For questions 17 and 18, use the graphs of the polynomials f and g.

Graph of f



Graph of g



17. The function r is defined by $r(x) = \frac{f(x)}{g(x)}$. What is the value of the $r(0)$?

(A) -2

(B) 0

(C) -1

(D) 3

$r(0) = \frac{f(0)}{g(0)} = \frac{-3}{3} = -1$

18. The function r is defined by $r(x) = \frac{f(x)}{g(x)}$. What are all the vertical asymptotes of the graph $y = r(x)$?

(A) at $x = -2$ only

(B) at $x = 3$ only

(C) at $x = -2$ and $x = 3$ only

(D) There are no vertical asymptotes.

$r(x) = \frac{(x-3)}{(x+2)(x-3)}$

vertical asymptote

hole

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