H. Algebra 2

Module 5 Review

Name: Key **Date:** ______________ **Hour:** ____

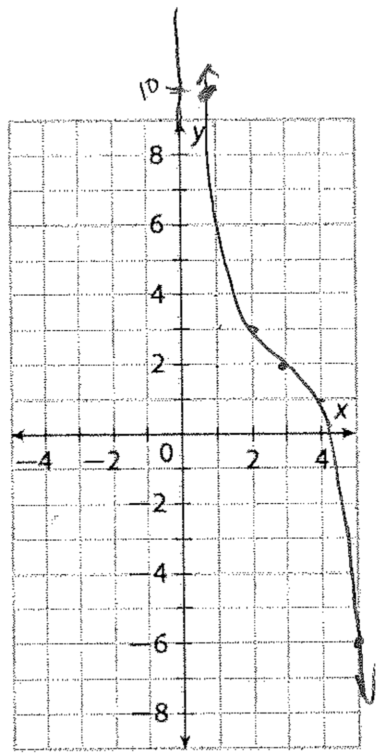
5.1 – Cubic Functions

For 1-2, describe, **in words**, the transformations applied to the graph of $f(x) = x^3$ to produce the graph of $g(x)$. Then graph $g(x)$ with at least 3 specific points.

1) $g(x) = -(x-3)^3 + 2$

Transformation(s):
reflect over x-axis
Right 3
up 2

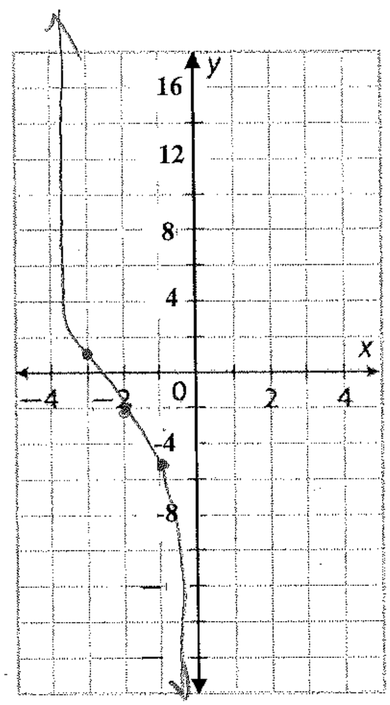
x	$g(x)$
1	10
2	3
3	2
4	1
5	-6



2) $g(x) = -3(x+2)^3 - 2$

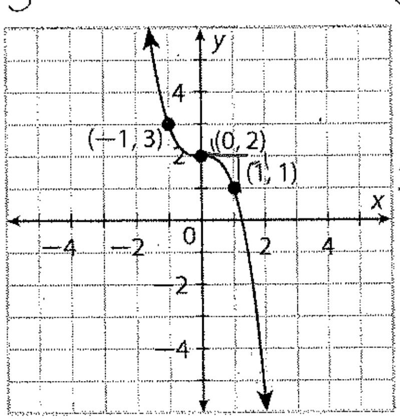
Transformation(s):
reflect over x axis
vert stretch 3
left 2
down 2

x	$g(x)$
-4	22
-3	1
-2	-2
-1	-5
0	-26



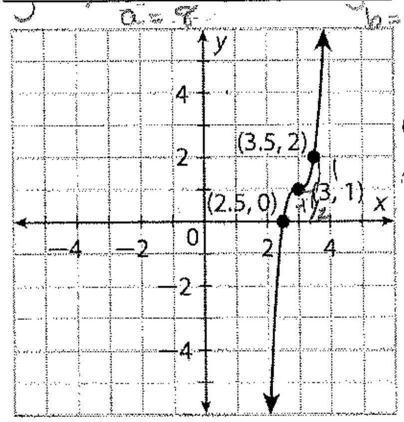
For 3-4, given the general equation $f(x) = a(x-h)^3 + k$, write the specific equation for the graph.

3) $g(x) = -(x)^3 + 2$ or $g(x) = (-x)^3 + 2$
$b = -1$



$h = 0$
$k = 2$
$P(1,1)$
$g(x) = a(x-0)^3 + 2$
$1 = a(1)^3 + 2$
$-1 = a$

4) $g(x) = 8(x-3)^3 + 1$ or $g(x) = (2(x-3))^3 + 1$
$a = 8$ $b = 1/2$



$h = 3$ $k = 1$ $P(2.5, 0)$
$0 = a(2.5-3)^3 + 1$
$-1 = a(-1/2)^3$
$-1 = -\frac{1}{8}a$
$\boxed{8 = a}$

For 5-6, write the specific equation of the form $g(x) = a\left(\frac{1}{b}(x-h)\right)^3 + k$ after the given transformations of the graph of $f(x) = x^3$.

5) A reflection across the x-axis, followed by a translation 11units up and 7 units to the left.

$g(x) = -(x+7)^3 + 11$

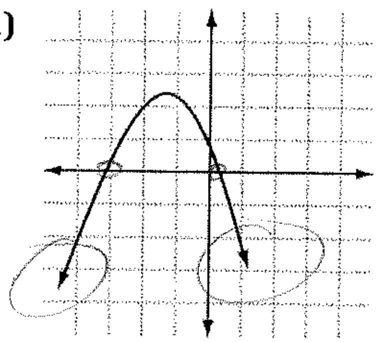
6) A vertical stretch by a factor of 6, followed by a translation 9 units to the right and 3 units down.

$g(x) = 6(x-9)^3 - 3$

5.2 – Polynomial Functions

For 1-3, identify whether each function graphed has an odd or even degree and a positive or negative leading coefficient.

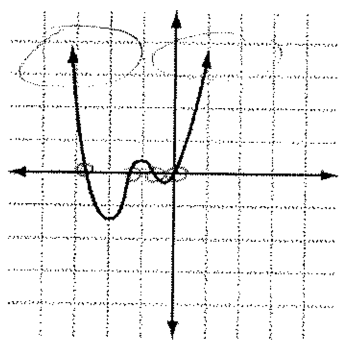
1)



Degree: even @ least 2nd

Leading Coeff: —

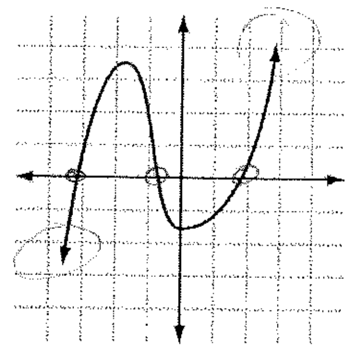
2)



Degree: even @ least 4th

—Leading Coeff: +

3)



Degree: odd @ least 3rd

Leading Coeff: +

For 4-5, graph each function on a graphing calculator to determine the number of turning points, the number of global maximum and/or minimum values, and the number of local maximum and/or minimum values that <u>are not global</u>.

4) $f(x) = x(x-4)^2$

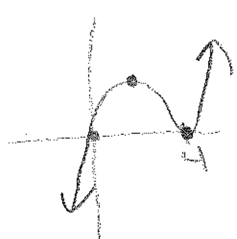
Turning Points: 2

Global Maximum(s): 0

Local Maximum(s): 1

Global Minimum(s): 0

Local Minimum(s): 1



5) $f(x) = -x^2(x-2)(x+1)$

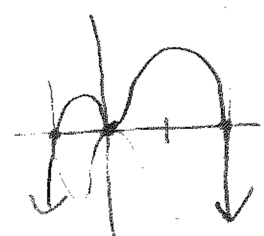
Turning Points: 3

Global Maximum(s): 1

Local Maximum(s): 1

Global Minimum(s): 0

Local Minimum(s): 1



For 6-9, graph each function **without a calculator**. State the degree, end behavior, x- and y- intercepts, and the intervals where the function is positive or negative in interval notation.

6) $f(x) = -(x-1)^2(x+3)$

Degree: 3rd

End Behavior: As $x \to \infty, f(x) \to -\infty$

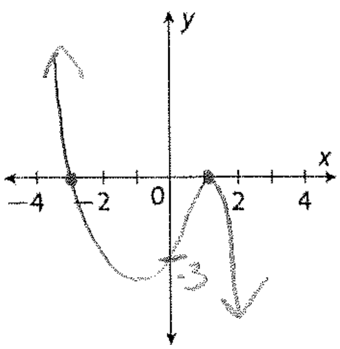
As $x \to -\infty, f(x) \to \infty$

y=0 x – intercept(s): $x = -3, 1$

x=0 y – intercept : $y = -3$

Positive: $(-\infty, -3)$

Negative: $(-3, 1) \cup (1, \infty)$



7) $f(x) = (x+2)(x-3)(x-1)$

Degree: 3rd

End Behavior: As $x \to \infty$ $f(x) \to \infty$

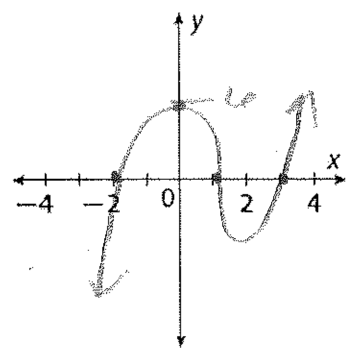
As $x \to -\infty$ $f(x) \to -\infty$

x – intercept(s): $x = -2, 3, 1$

y – intercept : $y = 6$

Positive: $(-2, 1) \cup (3, \infty)$

Negative: $(-\infty, -2)(1, 3)$



8) $f(x) = x(x-4)(x+1)$

Degree: 3rd

End Behavior: As $x \to \infty, f(x) \to +\infty$

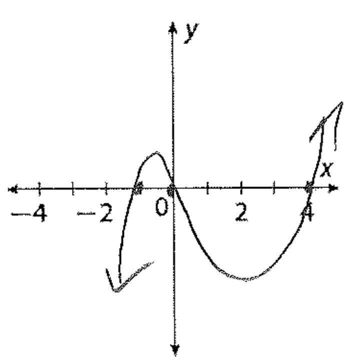
As $x \to -\infty, f(x) \to -\infty$

x – intercept(s): $x = -1, 0, 4$

y – intercept : $y = 0$

Positive: $(-1, 0)$ $(4, \infty)$

Negative: $(-\infty, -1) \cup (0, 4)$



9) $f(x) = -x^2(x+3)$

Degree: 3rd

End Behavior: As $x \to \infty, f(x) \to \infty$

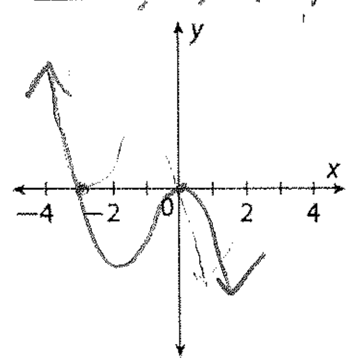
As $x \to -\infty, f(x) \to -\infty$

x – intercept(s): $x = 0, -3$

y – intercept : $y = 0$

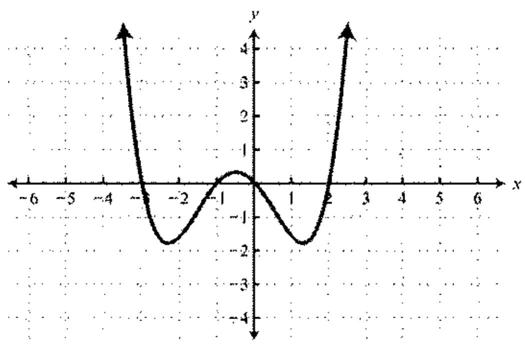
Positive: $(-\infty, -3)$

Negative: $(0, \infty)$ $(-3, 0)$

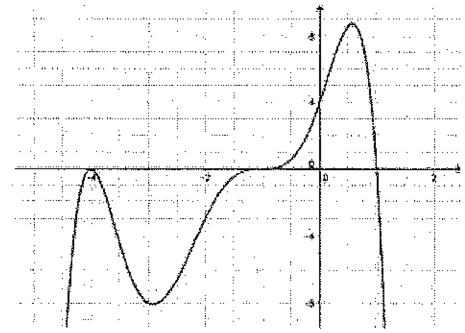


For 10-13, write the equation of each graph in intercept form, with integer x-intercepts. Assume the leading coefficient, a, is either 1 or -1.

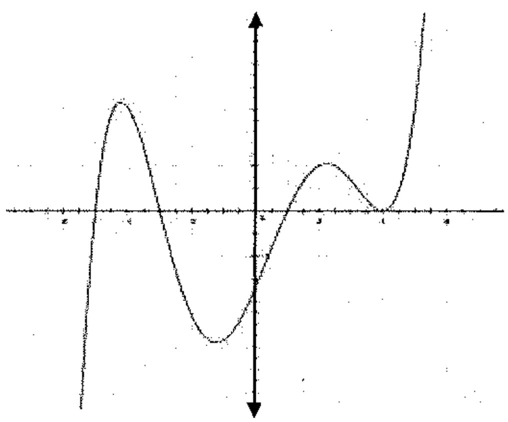
10) $f(x) = +(x+3)(x+1)(x)(x-2)$



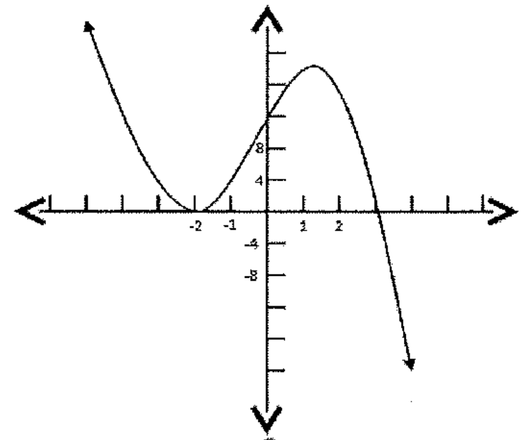
11) $f(x) = -(x+4)^2(x+1)^3(x-1)$



12) $f(x) = +(x+5)(x+3)(x-1)(x-4)^2$



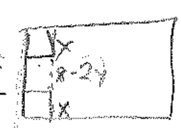
13) $f(x) = -(x+2)^2(x-3)$



For 12-13, write a function, $V(x)$, for the volume of the box that could be made by cutting an x in. by x in. square from each corner of the given rectangular piece of cardboard. Then, graph your function to answers the questions that follow. *Approximate decimal answers to the nearest 10th.*

12) 8 in. x 15 in.

$V(x) =$ $(x)(8-2x)(15-2x)$



A. What is the maximum possible volume? $V = 90.7 in^3$

B. What value of x maximizes the volume? $x = 1.7 in$

C. What are the dimensions of the box with the maximum volume?

h = 1.7 in l = 11.6 in
w = 4.6 in

D. What are the domain and range of the function?

D: $0 \le x \le 4$
R: $0 \le V(x) \le 90.7$

13) 19in. x 15 in

$V(x) =$ $(x)(15-2x)(19-2x)$

A. What is the maximum possible volume? $V = 352.7 in^3$

B. What value of x maximizes the volume? $x = 2.8 in$

C. What are the dimensions of the box with the maximum volume?

h = 2.8 in
w = 9.4 in
l = 13.4 in

D. What are the domain and range of the function?

D: $0 \le x \le 7.5$
R: $0 \le V(x) \le 352.7$