Name: MR. YOUNG RUBRIC Date: 10/11/2013 Prd: 1/2/3

POLYNOMIALS PRACTICE FOR THE QUIZ

Don't use a calculator (or at least only use the basic features if you really need to). You won't be able to use one on the quiz so this will be good practice!

1.) A.) Which of the following functions are sure to be the graph of polynomial functions. Which are not. If it is a polynomial function, state a possible degree and leading coefficient that would be possible given the graph (i.e. $4x^7$).

Yes NO NO Yes

neg. and odd

5 local min/maxes

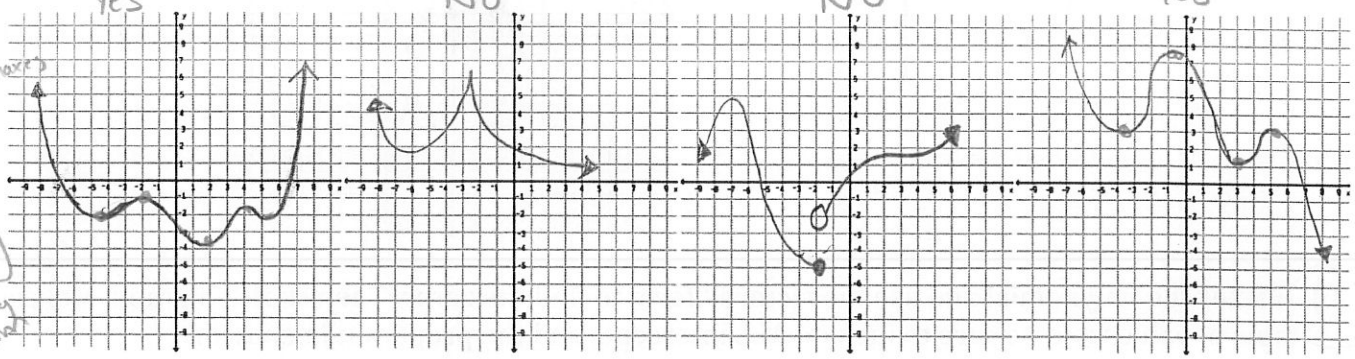
Positive even

$2x^6$

Possible leading term

$-3x^5$

Possible leading term

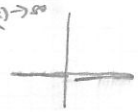


b.) Determine the end-behavior of each polynomial below. Sketch a quick graph of the end behavior.

$G(x) = 9x^6 - 8x^4 - 19$

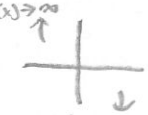
$x \to -\infty$, $f(x) \to \infty$

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



$H(x) = -3x^{15} - 9x^{14} + 8x^2 - 9x + 5$

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



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

2.) Graph the polynomial function by hand. Make a table of values and be sure to include ALL intercepts and the proper end behavior.

$P(x) = (x-1)^2(x-3)$

bounce

X-INT: 1, 3

Y-INT: $(0-1)^2(0-3)$

$(-1)^2(-3)$

$1(-3)$

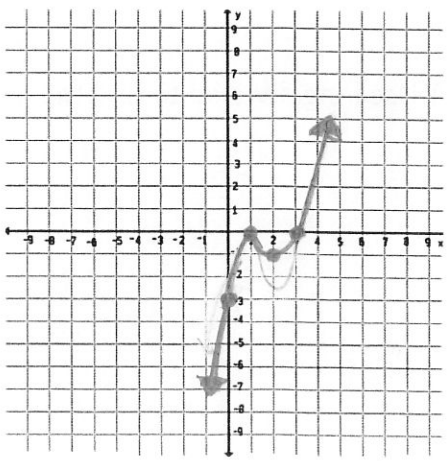
Y-INT: -3

X	Y
0	-3
1	0
2	-1
3	0

$(2-1)^2(2-3)$

$(1)^2(-1)$

$= -1$



Name:_____ Date:_____ Prd:_____

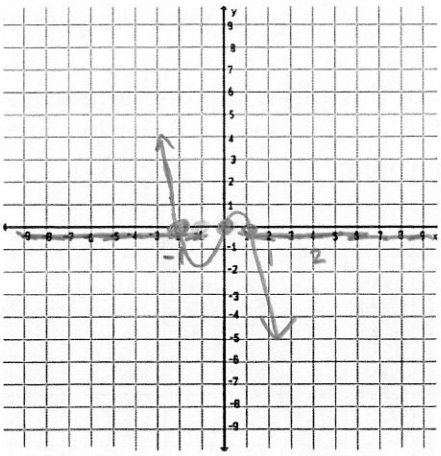
3.) Factor the polynomial and use the factored form to find the zeros. Then sketch a graph. Make a table of values and be sure to include ALL intercepts and the proper end behavior.

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

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

$= -x(2x - 1)(x + 1)$

$\boxed{\text{Zeros: } 0, \frac{1}{2}, -1}$



x	y
-1	0
-1/2	
0	0
1/4	
1/2	0

4.) Factor the polynomial and use the factored form to find the zeros. Then sketch a graph. Make a table of values and be sure to include ALL intercepts and the proper end behavior.

$P(x) = x^4 - 2x^3 + 8x - 16$

$x^3(x-2) + 8(x-2)$

Sum of cubes!

$(x^3 + 8)(x - 2)$

$(a+b)(a^2 - ab + b^2)$

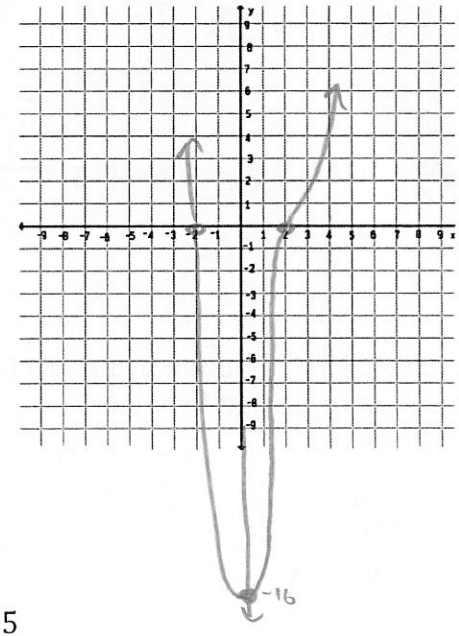
$(x+2)(x^2 - 2x + 4)(x-2)$

$(x+2)(x-2)(x^2 - 2x + 4)$

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

SKIP

You get Imaginary Solutions! Sorry!



5.) Use long division to find the quotient.

$$\frac{9x^2 - x + 5}{3x^2 - 7x}$$

$\boxed{3x + \frac{20x+5}{3x^2-7x}}$

$3x^2 - 7x + 0 \overline{)\, 9x^2 - x + 5}$

$-(9x^2 - 21x + 0)$

$20x + 5$ Remainder

Name:_____ Date:_____ Prd:_____

6.) Find the quotient.

$$\frac{x^3 - 9x^2 + 27x - 27}{x - 3} = \boxed{x^2 - 6x + 9} = (x-3)^2$$

3	1	-9	27	-27
		3	-18	27
	1	-6	9	0

7.) Use synthetic division and the remainder theorem to evaluate the following.

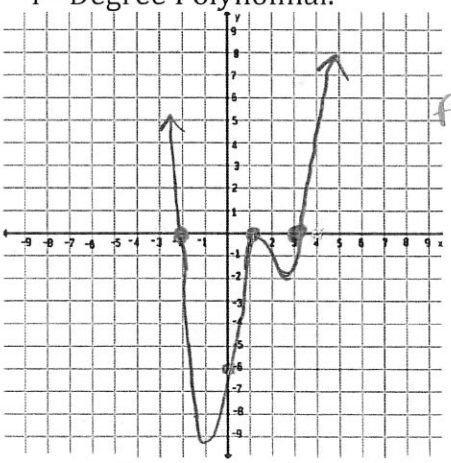
$P(x) = -2x^6 + 7x^5 + 40x^4 - 7x^2 + 10x + 112$ for $P(-3)$

$\boxed{P(-3) = 100}$

-3	-2	7	40	0	-7	10	112
		6	-39	-3	9	-6	-12
	-2	13	1	-3	2	4	$\boxed{100}$

8.) Find the polynomial of the specified degree whose graph is shown. (multiply it out).

4th Degree Polynomial.



leading coefficient is 1.

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

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

$(x^3-2x^2+x+2x^2-4x+2)(x-3)$

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

$x^4-3x^2+2x-3x^3+9x-6$

$\boxed{f(x) = x^4-3x^3-3x^2+11x-6}$

Name:_____ Date:_____ Prd:_____

9) Find all the rational zeros of the polynomial and write the polynomial in factored form.

$P(x) = x^3 - 4x^2 - 11x + 30$

$\frac{P}{Q} = \pm 1, 2, 3, 5, 6, 10, 15, 30$

1 30
2 15
3 10
5 6

1	1	-4	-11	30
		1	-3	-14
	1	-3	-14	16

5	1	-4	-11	30
		5	5	-30
	1	1	-6	0

$P(x) = (x-5)(x^2+x-6)$

$P(x) = (x-5)(x+3)(x-2)$

$\boxed{\text{Zeros: } 5, -3, 2}$

10.
a.)Find all the real zeros of the polynomial function.
b.) Use Descartes' Rule of signs to determine the number of possible positive and negative zeros.
b.) Sketch a graph by making a table of values (including all intercepts)

$P(x) = 6x^4 - 7x^3 - 12x^2 + 3x + 2$

a) $\frac{P}{Q} = \pm 1, 2, \frac{1}{6}, \frac{2}{6}, \frac{1}{3}, \frac{2}{3}, \frac{1}{2}, \frac{2}{2}$

2	6	-7	-12	3	2
		12	10	-4	-2
	6	5	-2	-1	0

$(x-2)(6x^3+5x^2-2x-1)$

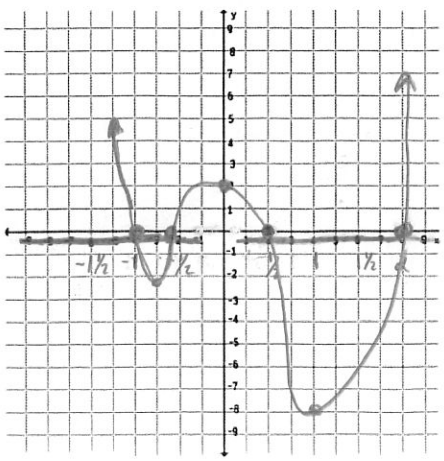
$\frac{P}{Q} = \pm 1, \frac{1}{6}, \frac{1}{3}, \frac{1}{2}$

-1	6	5	-2	-1
		-6	1	1
	6	-1	-1	0

$(x-2)(x+1)(6x^2-x-1)$

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

X	Y
-1	0
-3/4	-2.148
-1/2	0
0	2
1/2	0
1	-8



Note: I changed the x-axis scale

a) zeros: $2, -1, -1/3, \frac{1}{2}$

b) $P(x) = 6x^4 - 7x^3 - 12x^2 + 3x + 2$

$\boxed{\text{2 positive or 0 positive zeros}}$

$P(-x) = 6(-x)^4 - 7(-x)^3 - 12(-x)^2 + 3(-x) + 2$

$= 6x^4 + 7x^3 - 12x^2 - 3x + 2$

$\boxed{\text{2 negative or 0 negative zeros}}$

Name:_____ Date:_____ Prd:_____

QUADRATIC FUNCTIONS (Section 3.1)

Convert each quadratic function to standard form (vertex form). The state the coordinates of the vertex. Is the vertex a global minimum or maximum?

$\left(\frac{b}{2}\right)^2$

$\left(\frac{8}{2}\right)^2$

$4^2 = 16$

11.) $F(x) = 5x^2 + 40x - 19$

Complete the square. $\Rightarrow$ $5(x^2 + 8x + 16) - 19$

$5(x+4)^2 - 19 - 80$

$f(x) = 5(x+4)^2 - 99$

Vertex: $(-4, -99)$ ← minimum (opens down)

12.) $f(x) = x^2 + 8x$

$= x^2 + 8x + 16$

$f(x) = (x+4)^2 + 0$ ← k

vertex: $(-4, 0)$ ← MIN (opens down)

QUADRATIC FUNCTION MODELING

13.) Height of a ball. A ball is thrown directly upward in the air with a velocity of 50 ft/second. The ball's height after t seconds is given by $y = 50t - 16t^2$.

a.) What is the maximum height attained by the ball?

b.) After how many seconds will the ball hit the ground?

a) max: $\frac{-b}{2a}$ $\quad \frac{-50}{2(-16)} = \frac{-50}{-32} = \frac{25}{16}$ sec. $\boxed{1\,9/16 \text{ Seconds}}$

OR 1.5625 seconds

$f\left(\frac{25}{16}\right) = 50\left(\frac{25}{16}\right) - 16\left(\frac{25}{16}\right)^2 = \boxed{39.06 \text{ ft.}}$

b.) $0 = 50t - 16t^2$

$0 = t(50 - 16t)$

$t = 0$ $\quad 50 - 16t = 0$

$-50 \quad -50$

$\frac{-16t}{-16} = \frac{-50}{-16} = \frac{25}{8}$

$\boxed{t = 3\,1/8 \text{ seconds}}$ or 3.125 seconds.

Name:_____ Date:_____ Prd:_____

14.) A lacrosse team plays in an arena that has a seating capacity of 20,000 spectators. With the ticket price set at $12, average attendance at recent games has been 7500. A market survey indicates that for each dollar the ticket price is lowered, the average attendance increases by 800.

A.) Find a function that models the revenue in terms of ticket price.

R = Revenue
P = Ticket Price

Revenue = Price × Attendance

Attendance: $7500 + 800(12-P)$

This represents the change in price.

$$R(P) = P \cdot (7500 + 800(12-P))$$

$$P \cdot (7500 + 9600 - 800p)$$

$$R(P) = -800p^2 + 17{,}100p$$ ← Simplified

B.) Find the Price that maximizes revenue from ticket sales.

$$\frac{-b}{2a} \quad \frac{-17{,}100}{2(-800)} = \frac{-17{,}100}{-1600} = \$10.69$$ ← Price that maximizes revenue.

C.) What ticket price is so high that no-one attends and no revenue is generated.

SET Revenue to zero.

$$0 = -800p^2 + 17{,}100p$$

$$0 = P(-800p + 17{,}100)$$

$P = 0$

$$-800p + 17{,}100 = 0$$

$$\frac{-800p}{-800} = \frac{-17{,}100}{-800} = \$21.38$$

PRICE IS TOO High!

15.) Southwest Airlines is trying to decide the price of their new on-board WiFi. They have found that 125,000 people will purchase the wifi feature per day at a price of $8. A consumer report has done a study suggesting that for every 1 dollar increase in the price of the wifi feature, the number of people who will use the feature declines by 15,000. Write a function modeling the revenue from the service as a function of price. At what price does Southwest maximize its revenue?

a.)

$$R(P) = P \cdot (125{,}000 - 15{,}000(P-8))$$

R = revenue
P = wifi price

$$= P(125{,}000 - 15{,}000p + 120{,}000)$$

$$= P(245{,}000 - 15{,}000p)$$

$$R(P) = -15{,}000p^2 + 245{,}000p$$

b.)

$$\frac{-b}{2a} = \frac{-245{,}000}{2(-15{,}000)} = \$8.16$$