Name ______________________________ Class ____________ Date ________

Algebra 2 Honors Test Review, Sections 5.1-5.6, 5.8-5.9

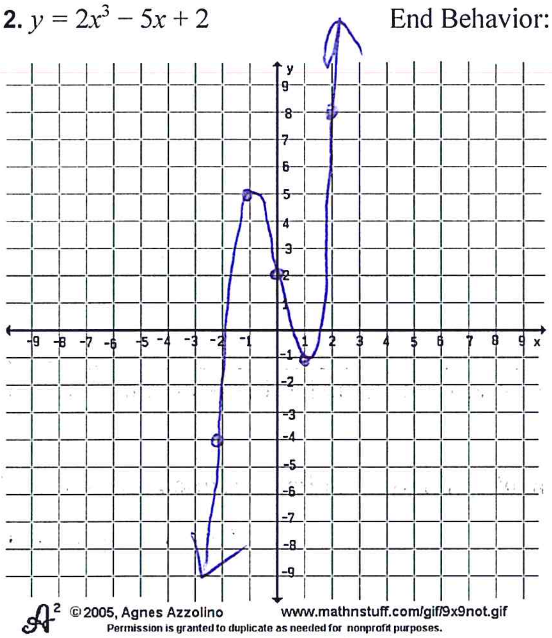
Write the polynomial function in standard form. Then classify it by degree and by number of terms.

1. $6x^5 - 2x^2 + 1 - 2x^5$

$6x^5 - 2x^5 - 2x^2 + 1 = \boxed{3x^5 - 2x^2 + 1}$

Determine the end behavior of the graph of the polynomial function. Then graph the function and name the relative minimum and relative maximum.

2. $y = 2x^3 - 5x + 2$ End Behavior: down and up Relative max: 5 $(-1, 5)$ Relative Min: -1 $(1, -1)$



x	y	
0	2	
1	-1	$2-5+2$
2	8	$16-10+2$
-1	5	$-2+5+2$
-2	-4	$-16+10+2$

Find the zeros of each function. State the multiplicity of each zero.

3. $y = (x + 2)(x - 3)^2$

$0 = (x+2)(x-3)^2$

$x + 2 = 0$ $(x-3) = 0$

$x = -2$ $x = 3$

m 1 m 2

Divide using long division. Show all work.

4. $(x^3 + 2x^2 + 4x + 10) \div (x + 1)$

$\boxed{x^2 + x + 3 + \frac{7}{x+1}}$

$x+1 \overline{) x^3 + 2x^2 + 4x + 10}$

$-\ x^3 + x^2$

$x^2 + 4x$

$-\ x^2 + x$

$3x + 10$

$-\ 3x + 3$

7

Write a polynomial function with rational coefficients so that $P(x) = 0$ has the given roots.

5. $-1, 2, 6$

$P(x) = (x+1)(x-2)(x+6)$

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

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

$P(x) = x^3 + 5x^2 - 8x - 12$

6. $-i, \sqrt{2}$

$i, -\sqrt{2}$

$P(x) = (x+i)(x-i)(x-\sqrt{2})(x+\sqrt{2})$

$(x^2 - i^2)(x^2 - 2)$

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

$x^4 - 2x^2 + 1x^2 - 2$

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

Find all the zeros of each function.

7. $y = x^3 + 8$

$0 = x^3 + 8$

$0 = (x+2)(x^2 - 2x + 4)$

$x + 2 = 0$ $\quad$ $\boxed{x = -2}$

$x^2 - 2x + 4 = 0$ $\quad$ $4 - 16$

$x = \frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot 4}}{2}$

$= \frac{2 \pm \sqrt{-12}}{2}$

$= \frac{2 \pm 2i\sqrt{3}}{2}$

$\boxed{x = 1 \pm i\sqrt{3}}$

8. $y = x^4 - 14x^2 + 45$

$0 = x^4 - 14x^2 + 45$

$0 = (x^2 - 5)(x^2 - 9)$

$x^2 - 5 = 0$ $\quad$ $x^2 - 9 = 0$

$x^2 = 5$ $\quad$ $x^2 = 9$

$\boxed{x = \pm\sqrt{5}, \pm 3}$

For the following function, list the possible rational zeros. Then us Descartes' Rule of Signs to determine the number of positive and negative real roots. Then find all roots.

9. $y = x^4 - 8x^3 + 19x^2 - 32x + 60$

Y Y Y Y

Neg: $y = x^4 + 8x^3 + 19x^2 + 32x + 60$
no changes

Possible rational zeros: $\pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 6, \pm 10, \pm 12, \pm 15, \pm 20, \pm 30, \pm 60$

Number of real zeros:

Positive: 4 or 2 or 0

Negative: 0

Roots: $3, 5, 2i, -2i$

	4	3	2	1	0
1 ✗	1	-8	19	-32	60
		1	-7	12	-20
	1	-7	12	-20	140

2 ✗	1	-8	19	-32	60
		2	-12	+14	-36
	1	-6	7	-18	24

$\boxed{3}$	1	-8	19	-32	60
		3	-15	12	-60
$\boxed{5}$	1	-5	4	-20	0
		5	0	20	
	1	0	4	0	

$\rightarrow x^2 + 4 = 0 \rightarrow x^2 = -4 \rightarrow x = \pm 2i$

or at this point: $x^3 - 5x^2 + 4x - 20 = 0$

$x^2(x-5) + 4(x-5) = 0$

$(x^2+4)(x-5) = 0$ $\quad$ $x = 5, \pm 2i$

10. Determine the cubic function that is obtained from the parent function $y = x^3$ after the sequence of transformations.
a vertical stretch by a factor of 3; a reflection across the y-axis; and a horizontal translation 4 units right

$y = -3(x-4)^3$

11. What is $P(2)$ given that $P(x) = 3x^4 - x^3 + 2x^2 - 10$? Use synthetic division and the Remainder Theorem.

2	3	-1	2	0	-10
		6	10	24	48
	3	5	12	24	38

$P(2) = 38$

12. Write a polynomial function of degree 3 with rational coefficients and exactly one real zero. List all of the zeros of the function.

zeros: $3, i, -i$

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

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

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

13. Find a polynomial function whose graph passes through (-1, -1), (0, 5), (1, 7). And (2, 17)

$-1 = a(-1)^3 + b(-1)^2 + c(-1) + d$ $\quad$ 5

$5 = a(0)^3 + b(0)^2 + c(0) + d \rightarrow 5 = d$

$7 = a(1)^3 + b(1)^2 + c(1) + d$ 5

$17 = a(2)^3 + b(2)^2 + c(2) + d$ 5

$-6 = -a + b - c$

$2 = a + b + c$

$12 = 8a + 4b + 2c$

$-6 = -a + b - c$

$2 = a + b + c$

$-4 = 2b \mid b = -2$

$-2(2 = a + b + c)$

$-4 = -2a - 2b - 2c$

$12 = 8a + 4b + 2c$

$8 = 6a + 2b$

$8 = 6a + 2(-2)$

$8 = 6a - 4$
$+4 \quad +4$

$12 = 6a$ $\quad$ $a = 2$

$2 = 2 - 2 + c$

$2 = c$

$y = 2x^3 - 2x^2 + 2x + 5$