Algebra 2

Name: _____

Notes 5.6

Date: _____ Hour: _____

The Fundamental Theorem of Algebra

Take note

Theorem The Fundamental Theorem of Algebra

If $P(x)$ is a polynomial of degree $n \geq 1$, then $P(x) = 0$ has exactly n roots, including multiple and complex roots.

The number of **complex** roots of an equation is equal to the _____ of the equation.

The *possible* number of **real** roots of an equation is equal to the possible number of _____ _____ of the related graph.

If the degree of the equation is *even*, the end behaviors of the graph are _____ and the possible number of x-intercepts or real roots is equal to the _____ or all _____ numbers less than the degree.

If the degree of the equation is *odd*, the end behaviors of the graph are _____ and the possible number of x-intercepts or real roots is equal to the _____ or all _____ numbers less than the degree.

For each equation, state the number of complex roots (c.r.), the possible number of real roots (p. # real r.), and list all possible rational roots (p.rat. roots).

HW # 1-4

1. $2x^3 + 2x^5 - x^2 + 12x - 8 = 0$

c.r. _____

p.# real r. _____

p. rat. roots _____

2. $3x^6 - 8x^4 + 2x^2 - 10 = 0$

c.r. _____

p.# real r. _____

p. rat. roots _____

When finding the roots of a polynomial you must read your directions carefully!!!

Are they asking you to find: a) all of the **rational** roots

b) all of the **real** roots

c) all of the **complex** roots

Find all of the **rational** roots of the polynomial.

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

2

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

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

2	1	-4	1	12	-12
		2	-4	-6	12
	1	-2	-3	6	0

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

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

$x^2-3=0$

$\sqrt{x^2} = \pm\sqrt{3}$

Find all of the **real** zeros of the polynomial.

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

3	1	-1	-3	-9
		3	6	9
	1	2	3	0

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

$x^2+2x+3=0$

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

$\sqrt{(x+1)^2} = \sqrt{-2}$

$x+1 = \pm\sqrt{2}\,i$

$x = -1 \pm \sqrt{2}\,i$

$x=3$

Find all the **complex** roots of the polynomial.

5. $P(x) = 2x^3 + x^2 + 1$

-1	2	1	0	1
		-2	+1	-1
	2	-1	+1	0

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

$-1, \quad \frac{1 \pm \sqrt{7}\,i}{4}$

$\frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{1 \pm \sqrt{1-4(2)(1)}}{4} = \frac{1 \pm \sqrt{7}\,i}{4}$

Algebra 2
Worksheet Section 5.6

Name _____
Date _____ Hour _____

For each equation, state the number of complex roots, the possible number of real roots, and list all the possible rational roots.

1. $2x^4 + x^2 - x + 6 = 0$

c.r. _____

p.# real r. _____

p. rat. roots _____

2. $4x^5 - 5x^4 + x^3 - 2x^2 + 2x - 6 = 0$

c.r. _____

p.# real r. _____

p. rat. roots _____

3. $6 - x + 2x^3 - x^3 + x^4 - 8x^5 = 0$

c.r. _____

p.# real r. _____

p. rat. roots _____

4. $2x^3 - 6x^2 - 7x - 12 = 0$

c.r. _____

p.# real r. _____

p. rat. roots _____

Find all the **rational** roots of each equation.

5. $P(x) = 3x^3 - 10x^2 + 9x - 2$

6. $P(x) = x^3 - 10x - 12$

Find all of the **real** roots of the polynomial.

7. $P(x) = 2x^3 + 5x^2 - x - 4$

8. $P(x) = x^4 - 2x^3 - x^2 - 4x - 6$

Find all of the **complex** zeros of the polynomial.

9. $P(x) = x^4 - 3x^3 - x^2 - 9x - 12$

10. $P(x) = x^5 - 3x^4 - 8x^3 - 8x^2 - 9x - 5$