Fundamental Theorem of Algebra Name: _____ A#___

Fundamental Theorem of Algebra: A polynomial of degree n has n zeros. These may include complex zeros.

1. When we looked at discriminants of quadratics we saw that quadratics could have1 real zero (w/multiplicity 2), 2 real zeros, or 2 imaginary zeros. Why did the imaginary zeros always come in a pair, but the real zeros could be 1 value or 2 values?

2. Imaginary Zeros must always come in pairs. Think about a cubic function. Circle all of the possible combinations of zeros for a cubic function. Sketch a picture for any of the possible combinations. Explain why the impossible combinations are not possible.

a) 0 imaginary and 3 real zeros

b) 1 imaginary and 2 real zeros

c) 2 imaginary and 1 real zeros

d) 3 imaginary and 0 real zeros

3. Now think about a quartic functions. Circle all of the possible combinations of zeros for a quartic function. Sketch a picture for any of the possible combination. Explain why the impossible combinations are not possible.

a) 4 imaginary and 1 real zeros

b) 3 imaginary and 1 real zeros

c) 2 imaginary and 2 real zeros

d) 2 imaginary and 3 real zeros

e) 1 imaginary and 3 real zeros

f) 0 imaginary and 4 real zeros

4.

Complete each statement with *always*, *sometimes*, or *never*. Explain your reasoning.

a. A quartic function _____ has 4 real roots.

b. A function of the *n*th degree _____ has *n* roots.

c. The number of *x*-intercepts _____ matches the number of roots of a function.

d. A function _____ has imaginary roots.

e. A function _____ has an odd number of imaginary roots.

5. For each criteria sketch 2 graphs that could have the characteristics listed below. If it is impossible to make a graph, explain why.

a) A polynomial with 2 imaginary roots and one real root with multiplicity of 2	b) A polynomial with 6 distinct real roots and a y-intercept at (0,-10)
c) A quartic with 2 real solutions each with a multiplicity of 2	d) A quintic function with 5 imaginary zeros.

6. If you were given a cubic polynomial and you knew it had the zeros $x = -4 \ and \ x = 2 + 3i$, what additional zero must it have?