Name_____

Precalculus Unit 2: Quest Review
Polynomial Functions

You may use your calculator as an aid in solving, but unless the directions are to solve with your calculator, show work for credit.

1. For the quadratic equation $f(x) = -3x^2 + 6x - 5$, find the vertex, the *x*-intercepts, and the y-intercept **algebraically**.

2. For the quadratic equation $f(x) = -2(x + 5)^2 + 10$ find the vertex, the x-intercepts, and the y-intercept **algebraically**.

3. The baseball team uses a baseball throwing machine to practice catching pop-ups. It throws the baseball up with an initial velocity of 64 feet per second from a height of 3.5 feet. The equation that models the height of the ball *t* seconds after it is thrown is given by $h(t) = -16t^2 + 64t + 3.5$. What is the maximum height the baseball will reach? How many seconds does it take to reach that height? **Find these values algebraically.**

4. Find the number of units x that produce a minimum cost C if $C = 0.01x^2 - 90x + 15{,}000$. **Find this algebraically.**

5. Use the leading Coefficient Test to determine the left-hand and right-hand behavior of the graph of the polynomial function $f(x) = -3x^5 + 2x^3 - 17$. **Explain your answer.**

6. Factor: $f(x) = 8x^3 + 125$

7. Find all the real zeros of $f(x) = x^5 - 5x^3 + 4x$ **by factoring**. Verify your answer with a graphing utility.

8. Divide: $(2x^4 + 7x^3 - x^2 - 13x + 5) \div (x^2 + 2x - 1)$ using polynomial division.

9. Find the real zeros of $f(x) = x^3 - 19x - 30$ **algebraically.** (Rational Root Test, Rule of Signs, Synthetic Division, etc…)

10. Find the real zeros of $f(x) = x^4 + x^3 - 8x^2 - 9x - 9$ **algebraically.** (Rational Root Test, Rule of Signs, Synthetic Division, etc…)

11. Find the zeros **algebraically**: $f(x) = x^4 + x^3 + 3x^2 + 5x - 10$ given that $x = \sqrt{5}i$ is a zero.

12. Multiply and write in standard form: $(7 - 5i)(-4 + 3i)$

13. Divide and write in standard form: $\dfrac{2 + 7i}{1 + i}$

14. Find a polynomial with real coefficients that has 2, 3, and i as zeros.

15. Explain how the multiplicity of a zero affects the graph.