Math 115 **Worksheet 12** **October 10, 2014**

Name _____
Group Members:

1. For each function, determine the long run behavior, determine the intercepts of the graph of the function, and sketch a rough graph of the function. If applicable, find the vertex of the function.
   (a) $g(x) = -x^2 - 4x - 3$
   (b) $h(x) = x^3 - 4x^2 - 16x + 64$
   (c) $\sigma(x) = x(x+3)(x+5) - 10(x+5)$

2. Show that $x = \frac{1}{2}$ and $x = 4$ are solutions of the equation $0 = 2x^4 - 3x^3 - 19x^2 - 6x + 8$. Use the result to list all the real solutions of the equation.

3. Juan owns a small business that manufactures knock-off tamagotchis called jamagotchis. His hourly production costs are $C(x) = 0.5x^2 - 20x + 460$ where C is the total cost in dollars and x is the number of toys produced. How many jamagotchis should be produced each hour to yield a minimum cost to Juan's business?

4. Find two positive real numbers whose product is maximum and whose sum is 110.

5. Find the real zeros of the following polynomials
   (a) $f(x) = 2x^3 - 11x^2 + 4x + 5$
   (b) $q(x) = x^4 - x^3 + x^2 - 3x - 6$
   (c) $p(x) = x^4 - 4x^2 + 4$
   (d) $v(x) = (x^2 - 7)^2 - 3(x^2 - 7) + 2$

6. Perform the following polynomial divisions, giving your answer in the form $f(x) = g(x)q(x) + r(x)$, where $q(x)$ is the quotient and $r(x)$ is the remainder.
   (a) $f(x) \div g(x)$ where $f(x) = 12x^3 + 4x^2 - x + 5$ and $g(x) = 3x - 5$
   (b) $f(x) \div g(x)$ where $f(x) = x^5 + 3x^3 + x^2 + 2x + 2$ and $g(x) = x^2 + 2$
   (c) $f(x) \div g(x)$ where $f(x) = -x^3 - x^2 - 8$ and $g(x) = x - 2$

7. Find a polynomial with integer coefficients with the zeros indicated.
   (a) $0, 5, -9$
   (b) $1, -4, 2$
   (c) $4, \pm\sqrt{5}$
   (d) $3\sqrt{2}, 4$

8. For each function, determine the long run behavior, determine the intercepts of the graph of the function, and sketch a rough graph of the function.

   (a) $g(x) = x^4 + 6x^3 + 10x^2 + 6x + 9$

   (b) $f(x) = x^3 - 13x - 12$

   (c) $h(x) = -3x^2 + 8x$

9. Find the rational zeros of the polynomial $p(x) = x^3 + x + 1$.

10. Find the intersection points of the graphs of the functions $f(x) = \frac{x^2}{3}$ and $g(x) = 2x - 4$.

Challenge: In question 3, for what price does Juan need to sell each toy in order to break even?