Math 1030 Workshop #5 (Due: July 26th, 2013) **Name:** _____

Please turn in a paper copy and **SHOW YOUR WORK!**

1. Consider the function $f(x) = \begin{cases} 3x^3 + 10x^2 + 5x + 1 & x \leq 0 \\ (8x^4 - 7x)e^{-x^2} + 4 & 0 < x \leq 2 \\ x^2 - 5x + \ln(x) & x > 2 \end{cases}$

   Be careful! Wolfram Alpha has a hard time interpreting commands applied to this function. You may want to deal with the function one piece at a time.

   (a) Find all of the critical points of $f(x)$. $x =$ _____

   (b) Restricting our attention to the interval $[-3, 5]$...

   The maximum value of $f(x)$ is _____. This occurs when $x =$ _____.

   The minimum value of $f(x)$ is _____. This occurs when $x =$ _____.

2. Todd's Rentals (located in Todd, NC) rents heavy duty pressure washers. Each washer costs \$800. Over time Todd has found that a typical pressure washer will require \$50 of repairs during its first year of operation, \$140 of repairs during its second year of operation, and \$305 of repairs during its third year of opertion.

   Use Excel to find a power model for the **average** annual repair costs. Then model the average annual cost of operating a pressure washer using a function of the form: $A(t) = \frac{C}{t} + Rt^r$ where C is the cost of purchasing the TV and Rt^r models the repair costs.

   $A(t) =$ _____

   When $t =$ _____, $A(t)$ is minimized. [Keep 5 decimal places.]

   Todd should replace his pressure washers every _____ years and _____ months.
   [Round up to the next whole month.]

   If he does this, his average annual cost (per washer) should be \$ _____.

3. Stacy runs a small fruit stand just outside of Boone. She pays \$1.25 per carton of blueberries and has found that her average storage cost is \$0.25 per carton per year (base inventory costs on average inventory making all of the standard assumptions). Suppose Stacy is charged \$20 every time she places an order. Let $C(x)$ be Stacy's annual cost function.

   (a) If Stacy sells 1200 cartons each year, $C(x) =$ _____

   Her **ideal** EOQ is _____ and her **ideal** minimum annual cost is _____.

   (b) If Stacy sells 150 cartons each year, $C(x) =$ _____

   Her **ideal** EOQ is _____ and her **ideal** minimum annual cost is _____.

   (c) Suppose that Stacy sells 2000 cartons per year and gets a small discount if she places a large order. For orders of 1500 or more blueberry cartons, she pays \$1.12 each. However, her shipping costs double to \$40 for a large shipment and her inventory costs double to \$0.50 per carton as well.

   $C(x) = \begin{cases} \end{cases}$

   Cindy's **ideal** EOQ is _____. Her **ideal** minimum annual cost is _____.