Math 1030 Workshop #5 (Due: July 27th, 2015) **Name:** _____

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

1. Consider the function $f(x) = \begin{cases} -0.2x^2 + x + 3 & x \leq -1 \\ (x-0.2)^2 e^{-0.3(x-0.2)^2} & -1 < x < 2 \\ 2x^3 - 10.6x^2 + 18x - 9 & x \geq 2 \end{cases}$

   Be careful! Wolfram Alpha may have trouble with this function. You might want to deal with it one piece at a time.

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

   (b) Restricting our attention to the interval $[-2, 3]$...

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

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

2. Green Villa Resort (located in Greenville, NC) uses golf carts to transport their guests around the grounds. Their carts cost $2,000. They have noticed that a cart typically requires $100 of repairs and maintenance during the its first year of operation, then $360 during its second year, and then $660 during its third year.

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

   $A(t) =$ _____

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

   Green Villa should replace its golf carts every _____ years and _____ months.
   [Round up to the next whole month.]

   If they do this, their average annual cost (per cart) should be $ _____.

3. Jonas manages an office which uses a lot of paper. He can get paper for $3 a ream and has found that his average storage cost is $0.05 per ream per year (base inventory costs on average inventory making all of the standard assumptions). Finally, Jonas pays $30 every time he places an order. Let $C(x)$ be his annual cost function (for paper).

   (a) If Jonas needs 1,000 reams each year, $C(x) =$ _____

   His **ideal** EOQ is _____ and his **ideal** minimum annual cost is _____.

   (b) If Jonas needs 10,000 reams each year, $C(x) =$ _____

   His **ideal** EOQ is _____ and his **ideal** minimum annual cost is _____.

   (c) Suppose that Jonas needs 5,000 reams each year. In addition, he found out that he gets a discount if he places a large order. For orders of 1,000 reams or more, he pays $2.75 per ream. However, the paper company makes large deliveries in their "big truck", so the shipping cost jumps to $200 and Jonas also figured that his inventory costs jump up to $0.15 per ream (based on average inventory).

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

   His **ideal** EOQ is _____. His **ideal** minimum annual cost is _____.