Math 1030 Workshop #5 (Due: July 27th, 2016) **Name:** _____

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

1. Consider the function $f(x) = \begin{cases} 3x^3 + 9x^2 + 5x + 3 & x \leq -1 \\ (7x^4 - 6x)e^{-x^2} & -1 < x \leq 1 \\ x^2 - 5x + 2\ln(x) & x > 1 \end{cases}$

   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 $[-2, 4]$...

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

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

2. Riverdale Highschool has an expensive copying machine. It could cost \$7,000 to replace their machine. They have recorded that they spent \$50 reparing the copier during its first year of operation. The next year it cost \$190 to fix their machine. The third year it cost \$350 to fix it.

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

   $A(t) =$ _____

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

   Riverdale should replace its copying machine after _____ years and _____ months of opertion. [Round up to the next whole month.]

   If they do this, their average annual cost (for the copier) should be \$ _____.

3. Stew's business uses specialty print cartridges for their photo ID printer each year. These cartridges cast \$150 a piece. Placing an order costs \$10. Stew's inventory cost is rather low. He estimates that it costs him \$0.10 per year per cartridge (based on average inventory with all of the standard assumptions). Let $C(x)$ be Stew's annual cost function for these cartridges.

   (a) If Stew needs 200 cartridges each year, $C(x) =$ _____

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

   (b) If Stew needs 1,000 cartridges each year, $C(x) =$ _____

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

   (c) Suppose that Stew needs 2,000 cartridges each year. In addition, he found out that he gets a discount if he places a large order. For orders of 300 or more, he pay \$135 per cartridge. However, there is an additional delivery fee for these large orders. Instead of \$10, it costs \$50 to place a large order. His inventory costs stay the same.

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

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