PART II.

Name: _____

You may use Excel and Maple to help with this part of the exam. **Show your work!**

3. (____/10 points) The International Pancake Museum has recorded the following information about the sales of a rather unattractive commemorative magnet:

Thousands of Visitors	1	3	6	8
Magnets Purchased	2	7	10	11

(a) Which type of function best models this data? (Circle one)

   Linear / Exponential / Logarithmic / Quadratic

(b) What (curve of best fit) formula did Excel find?

(c) Use your model to predict how many magnets will be sold if they have 9,000 visitors.

(d) How many visitors will they need if they want to sell 15 magnets?
   (Your answer should be accurate to 3 decimal places.)

4. (____/10 points) Jeb wants to buy a car. He can take out a 5 year loan (of any size) which charges 7% interest compounded monthly.

(a) Suppose he can only afford to pay $100 a month. How much money can he afford to borrow? What formula did you use?

(b) Suppose Jeb took out a $7,500 loan for his car. What will his monthly payment be? What formula did you use?

5. (____/10 points) Suppose that the demand function for some item is $p(q) = -10q + 120$ and the costs associated with this item are modeled by $C(q) = 100e^{q/50}$.

(a) Find the revenue function. $R(q) =$

(b) Find the profit function. $P(q) =$

(c) Find all break-even points.

6. (_____/**10 points**) Dwight has a beet farm. Let $R(q)$, $C(q)$, and $P(q)$ denote Dwight's revenue, cost, and profit functions associated with selling his beets. The units involved are hundreds of pounds of beets and hundreds of dollars. For example: $P(1) = 2$ would mean that Dwight makes a \$200 profit from selling 100 lbs. of beets. In addition, let $MR(q)$, $MC(q)$, and $MP(q)$ denote marginal revenue, cost, and profit.

(a) If $P(8) = 10$ and $MP(8) = 2$, approximately how much will Dwight make from selling 850 pounds of beets? (Note: $8.5 = 8 + (1/2)1$)

(b) If $MP(10) = -3$, should Dwight sell...

<div align="center">

MORE or **LESS**

</div>

...than 1000 lbs. of beets to increase his profit? Circle and then explain your answer.

7. (_____/**10 points**) Let $f(x) = \begin{cases} (x+1)^2 & x \le 0 \\ -x^2 + 4x & x > 0 \end{cases}$

(a) Sketch the plot of $f(x)$ for $-2 \le x \le 1$.

(b) The maximum value of $f(x)$ for $-2 \le x \le 1$ is _____.

The maximum value is located at $x =$ _____.

(c) The minimum value of $f(x)$ for $-2 \le x \le 1$ is _____.

The minimum value is located at $x =$ _____.

8. (_____/**10 points**) Winston sells fine chocolates. He can get his chocolate for \$1 a pound and he usually sells about 25,000 lbs. of it each year. Suppose that it costs him about \$0.03 to store a pound of chocolate for 1 year. In addition, it costs him \$10 to place an order. [Note: Base Winston's inventory costs on the average amount of chocolate stored.]

(a) If Winston always orders x lbs. of chocolate at a time, what is Winston's annual cost function?

$C(x) =$

(b) In order to minimize costs, Winston's (ideal) order size is _____ lbs. of chocolate.

9. (____/10 points) Suppose that the demand curve for some product is $d(q) = 10e^{-q}$ and the supply curve is $s(q) = 3q + 1$

(a) Find the Market Equilibrium: $(q_0, p_0) = \left(\underline{\hspace{2cm}} , \underline{\hspace{2cm}}\right)$

(b) Find the *Producer* Surplus and state the formula you used to find your answer.

10. (____/10 points) Let $b(t) = 5te^{-t^2/10}$ be the birthrate of Eastern Lambertopia where $b(t)$ is measured in millions of births per year, t years after the beginning of the year 2000. [For example: $b(1) = 4.524187090$ means that the birthrate at the beginning of 2001 was about 4,524,187 births per year.]

(a) According to our birthrate function, how many babies will be born in Eastern Lambertopia (starting from the beginning of the year 2000 until the end of time)? What formula did you use?

(b) How many births were there during the year 2002? What formula did you use?