PART II.

Name: _____

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

3. (____/10 points) Frank has recorded the following sales information (year 5 means the year 2005):

year	5	6	7	8
sales	$10,000	$10,250	$12,000	$16,000

(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 what the sales will be in year 9 (i.e. next year).

(d) When – in the future – will sales reach $50,000?
(Your answer should be accurate to 3 decimal places.)

4. (____/10 points) Bob and Cindy just bought a $250,000 house. They paid 10% down and took out a 30 year mortgate with a 6% interest rate (compounded monthly)

(a) How much money did they borrow to purchase their house?

(b) What will their monthly mortgage payment be? What formula did you use?

(c) How much will they still owe after 15 years? What formula did you use?

5. (____/10 points) Suppose that the demand function for some item is $p(q) = 100e^{-q/10}$ and the costs associated with this item are modeled by $C(q) = 15q + 200$.

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

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

(c) Find all break-even points.

6. (____/10 points) Jim and Pam sell office supplies. Let $R(q)$, $C(q)$, and $P(q)$ denote their revenue, cost, and profit functions associated with selling pens. The units involved are thousands of pens and thousands of dollars. For example: $P(1) = 2$ would mean that they make \$2,000 of profit from selling 1,000 pens. In addition, let $MR(q)$, $MC(q)$, and $MP(q)$ denote marginal revenue, cost, and profit.

(a) If $C(10) = 12$ and $MC(10) = 3$, approximately how much will it cost to sell 12,000 pens?

(b) Jim and Pam have sold 10,000 pens. If $MR(10) = 4$, should Jim and Pam sell...

<div align="center">

MORE or **LESS**

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...pens to increase revenue? Circle and then explain your answer.

7. (____/10 points) Let $f(x) = \begin{cases} x^2 + 4x + 3 & x \leq 1 \\ -2x + 10 & x > 1 \end{cases}$

(a) Sketch the plot of $f(x)$ for $-1 \leq x \leq 3$.

(b) The maximum value of $f(x)$ for $-1 \leq x \leq 3$ is _____.

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

(c) The minimum value of $f(x)$ for $-1 \leq x \leq 3$ is _____.

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

8. (____/10 points) Sal sells premium steaks. He can get his steaks for \$5 a pound and he usually sells about 1,000 lbs. of steak each year. Suppose that it costs Sal about \$0.50 to store a pound of steak for 1 year. In addition, it costs him \$25 to place an order. [Note: Base Sal's inventory costs on the average amount of steak stored.]

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

$C(x) =$

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

9. (___/**10 points**) Suppose that the demand curve for some product is $d(q) = -10q + 100$ and the supply curve is $s(q) = 2q^2 + 20q$

(a) Find the Market Equilibrium: $(q_0, p_0) = \left(\underline{\hspace{1cm}} , \underline{\hspace{1cm}}\right)$

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

10. (___/**10 points**) Let $s(t) = t^2 e^{-t/2}$ be the rate of spork usage in Boone where $s(t)$ is measured in millions of sporks used per year t years after the beginning of the year 1909 (when sporks were introduced). [For example: $s(1) = 0.6065306597$ means that at the beginning of 1910 sporks were being used at a rate of about 606,531 sporks per year.]

(a) According to our spork-rate function, how many sporks will Boone use over all time (starting from the beginning of the year 1909 until the end of time)? What formula did you use?

(b) How many sporks were used during the year 1910? What formula did you use?