

Math 112, Winter 2015, Midterm II

February 26, 2015

Name _____

TA/Section _____

Instructions.

- There are 4 questions. The exam is out of 50 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. It has to be the original and not a photocopy. **Hand in your notes with your exam paper.**
- You may use a calculator which does not graph and which cannot do calculus.
- **Show your work.** If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. Please BOX your final answer.

Copying from someone elses paper, using notes (unless expressly allowed by the teacher), altering an exam for re-grading, getting an advance copy of the examination, or hiring a surrogate test-taker are all flagrant violations of University policy.

Source: Student Academic Responsibility, University of Washington

Question	points
1	
2	
3	
4	
Total	

1. (13 points)

(a) $\frac{d}{dx} \sqrt{3 + 5 \ln x}$

(b) $\int \frac{2\sqrt{x} + 7x^2 + 9}{5x^3} dx$

(c) $\int \sqrt{3 + 7x} dx$

Hint: Check your answer by differentiating.

2. (19 points) You produce and sell Palabras. Your Marginal Revenue and Marginal Cost (both in dollars per Palabra) are given by the formulas

$$\mathbf{MR}(q) = 20 - 0.65q \quad \text{and} \quad \mathbf{MC}(q) = 0.15q^2 - 2.4q + 10.8,$$

where q is in thousands of Palabras.

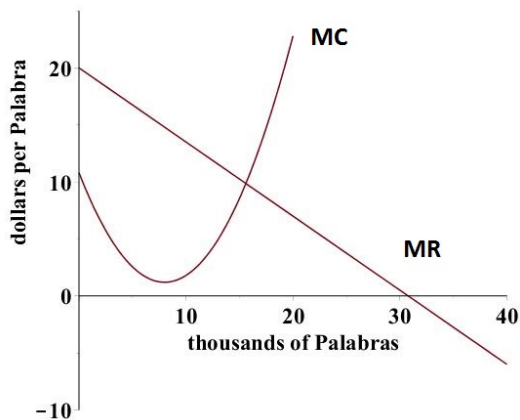
- (a) At what quantity is the profit maximized? Give your answer to the nearest Palabra.

- (b) Give the formulas for Variable Cost and Total Revenue.

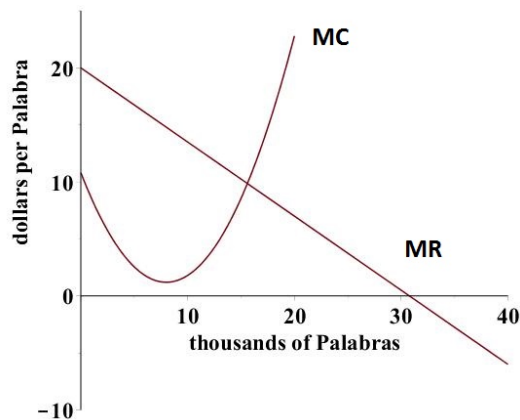
- (c) If you sell $q = 10$ thousand Palabras, then your profit is 123 thousand dollars. Find the value of your fixed costs. Give units with your answer.

- (d) Find the maximum profit. Give units with your answer.

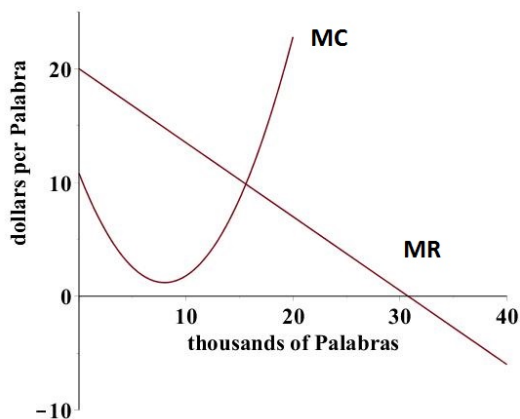
- (e) There are four identical graphs of Marginal Revenue and Marginal Cost below. Show the quantity which is described below each on the graph (as points, horizontal or vertical coordinates, slopes of lines or areas, whichever applies). Do not try to compute or estimate the quantities.



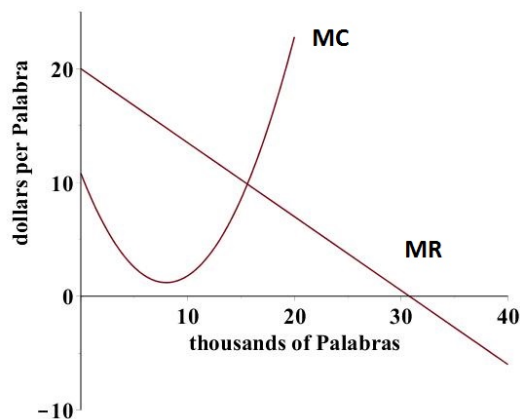
The maximum revenue



The Variable Cost at $q = 4$



The rate of change of Marginal Cost at $q = 15$.



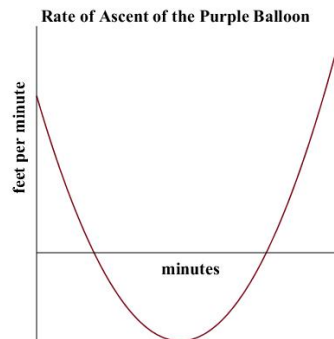
The change in profit from $q = 2$ to $q = 8$.

3. (10 points) A purple balloon moves up and down and its rate of change of altitude is given by

$$p(t) = 2t^2 - 15t + 18$$

where t is in minutes and the rate is in feet per minute. Below is the graph of $p(t)$ to help you visualize.

- (a) In which interval(s) is the altitude increasing?



- (b) If we graph the altitude function $P(t)$ of the balloon, in which interval(s) will it be concave down?

- (c) What is the average rate of change of altitude of the balloon during the first two minutes?

- (d) If the balloon is at 23 feet at $t = 3$, does it ever touch the ground? This should not involve solving a cubic equation.

4. (8 points) Below is the graph of the demand and supply functions for a product. The formula for the demand function is $p = \frac{630}{x+5}$ and the supply function is $p = 2x + 27$. Mark the functions as DEMAND and SUPPLY on the graph and find the consumer's surplus which is represented by the shaded area.

