# Math 111 Winter 2019 Midterm II

# March 5, 2019

**Name**‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗

**TA/Section**‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗‗

## Instructions.

- There are 4 questions. The exam is out of 40 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 only use a TI 30X IIS calculator.

- Round your final answers to two digits after the decimal.

- **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.

*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. You produce and sell Things. For the production, the Marginal Cost and the Average Variable Cost are given in terms of $q$ things by

$$MC = 0.021q^2 - 2.1q + 75 \qquad\qquad AVC = 0.007q^2 - 1.05q + 75$$

dollars per Thing. The Fixed Cost is \$500. For selling Things, the Price $p$ and the Marginal Revenue are given in terms of the quantity $q$ Things by

$$p = -0.008q^2 + 0.96q + 21.6 \qquad\qquad MR = -0.024q^2 + 1.92q + 21.6$$

dollars per Thing.
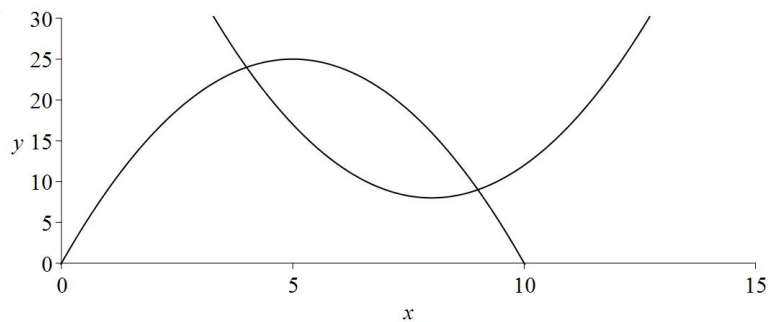
(a) (2 points) Give the formulas for the following:

The Total Revenue $TR =$

The Total Cost $TC =$

(b) (4 points) What is the Shutdown Price?

(c) (5 points) What is the Maximum Profit?

2. On the right are graphs of $f(x) = -x^2 + 10x$ and $g(x) = x^2 - 16x + 72$. Estimating coordinates from the graph is not considered a complete solution. However, you can check your algebraic solutions by looking at the graph.



(a) (1 point) Label the functions on the graph.

(b) (5 points) Let $y = mx + b$ be the line that passes through the two intersection points of the parabolas. Find $m$ and $b$.

(c) (3 points) Find the interval where both $f(x)$ and $g(x)$ are decreasing.

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3. Dionysus Wineries in Tenedos produces two types of blended wines, Poseidon and Artemis, by blending two types of grape varieties, Shiraz and Muscat. Poseidon has 40% Shiraz and 60% Muscat and Artemis has 75% Shiraz and 25% Muscat. The winery does not grow its own grapes. They can get at most 210 gallons of Shiraz juice from one vineyard and at most 168 gallons of Muscat juice from another vineyard. They have to produce at least 200 gallons of wine to fulfill their existing contracts with restaurants. Their maximum capacity for production is 450 gallons.

(a) (7 points) Let $x$ be the gallons of Poseidon blend and $y$ be the gallons of Artemis blend the winery produces. List all the constraints and graph the feasible region below. List all the corners of your feasible region.

**Dionysus Wineries**

(Gallons of Artemis vs. Gallons of Poseidon — blank grid, axes from 0 to 700)
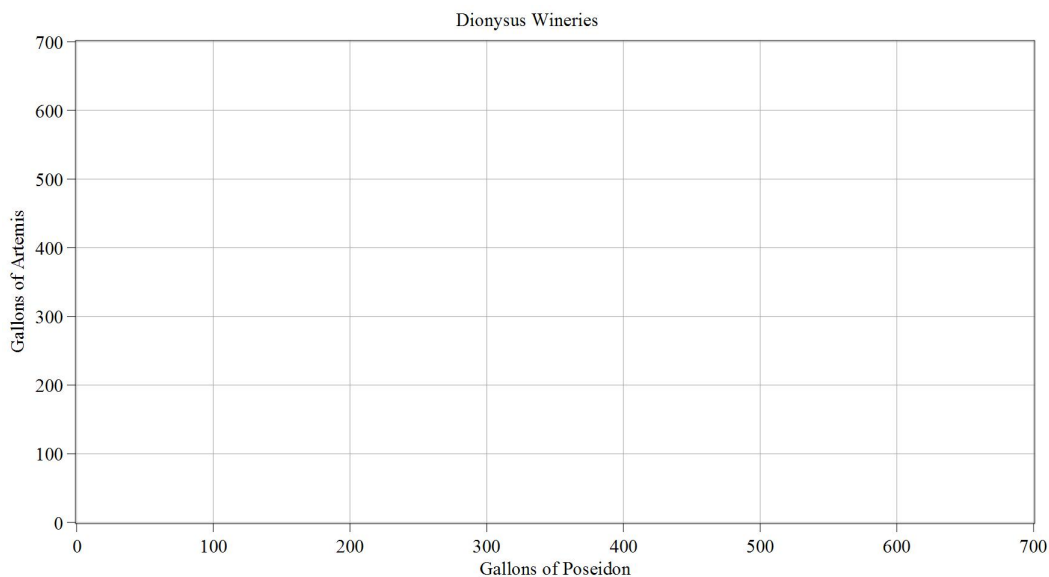
(b) (3 points) They make a profit of 35 dollars on every gallon of Poseidon and a profit of 27 dollars on every gallon of Artemis. What is the production level for Poseidon and Artemis blends that will maximize the profit of the winery?

4. If you invest $15,500 in an account with 6% annual interest compounded monthly, the amount in your account after $t$ years is given by
$$A = 15500(1.005)^{12t}.$$

(a) (5 points) How much do you have in your account after 3 years?

(b) (5 points) When will you double the money you have invested?