Math 111 Winter 2017, Midterm I

January 31, 2017

Name___Soluhons_____

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.

- **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. My dog and I leave our house and walk towards the school to pick up the children. He sniffs around too much so we cannot keep a constant speed. The following is the graph of our distance from the house in feet at time t in minutes since we have left the house. The school is 1800 feet from our house.

Label the lines you draw. For example, next to the line you drew to compute part (b), write (b) so we can follow your work. Include units in your answers.

Home-School Walk
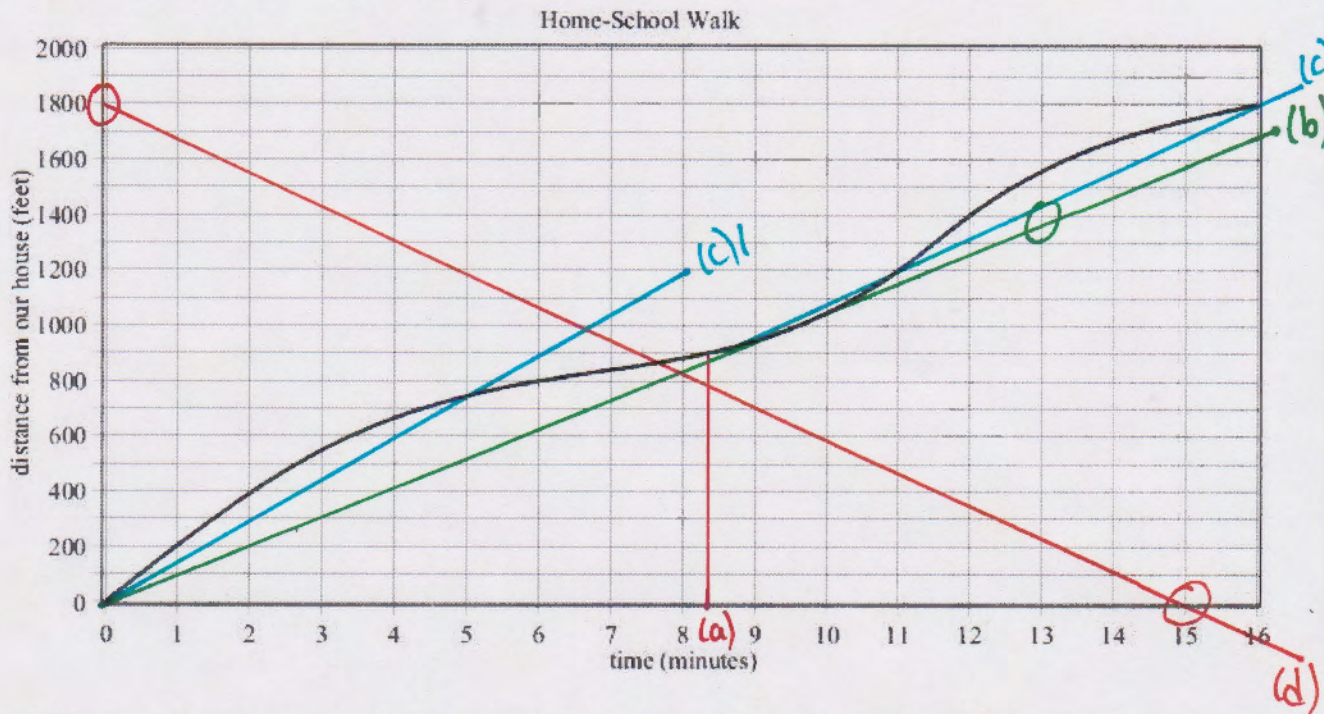
(a) (2 points) How long does it take us to cover half the distance from the house to the school?

8.35 minutes   [8.2, 8.5]

(b) (4 points) When is our Average Trip Speed lowest? What is the value of our lowest Average Trip Speed? **9.6 mmutes   [9.3, 9.9]**

Slope $\simeq \dfrac{1360}{13} \simeq 104.6$ ft/min   [95, 120]

(c) (2 points) Which one is more: Our Average Speed in the first 5 minutes or our Average Speed in the last 5 minutes? Why?

First 5 mmutes because line (c)| is steeper.

(d) (3 points) The children leave the school at the same time we leave the house, walking towards the house. They walk at a constant speed of 120 feet per minute. Add the graph of their distance to the house above and estimate when we will run into each other.

They start at school   (0, 1800)
in 15 mmutes, they will get $15 \times 120 = 1800$ ft closer
so they will be at home   (15, 0)
we'll run into each other at around 7.7 mmutes
**   [7.5, 7.9]**

2. You produce and sell Orbs. The following are graphs of Total Cost and Total Revenue. Label the lines you draw. For example, next to the line you drew to compute part (b), write (b) so we can follow your work. Include units in your answers. Round your answers to the nearest cent.

TC and TR for Producing and Selling Orbs
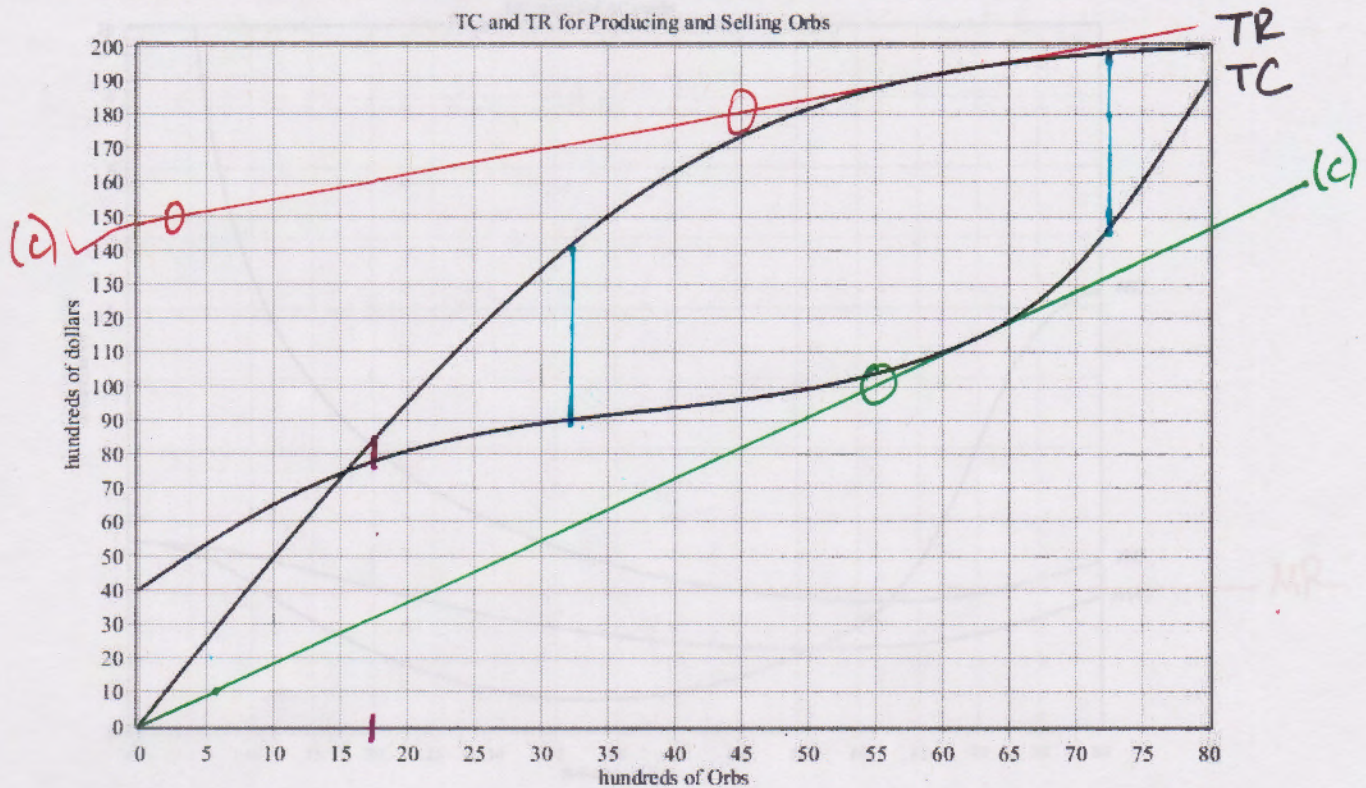
(a) (1 point) Decide which one is Total Cost and which one is Total Revenue and label them as TC and TR. $TR(0)=0$ $TR(0)=TC=4000$

(b) (3 points) What is the Average Variable Cost at 5000 Orbs?
$$AVC(5000) = \frac{VC(5000)}{5000} = \frac{TC(5000)-FC}{5000} = \frac{10000-4000}{5000} = \$1.2$$

(c) (3 points) What is the revenue from the sale of the 6001st Orb? $MR(6000)$
$$slope \approx \frac{180-150}{45-2.5} \approx 0.71 \qquad [0.55, 0.85]$$

(d) (2 points) What is the Breakeven Price?
$$Slope \approx \frac{100}{55} \approx 1.81 \qquad [1.7, 1.9]$$

(e) (2 points) How many Orbs should we sell to make at least 500 dollars in profits?

About 17.5 hundred $(\pm 0$ hundred$)$

3

3. You produce and sell Fits. The following are graphs of Marginal Cost, Average Variable Cost and Average Cost. You sell each Fit for 2 dollars. Include units in your answers. Round your answers to the nearest cent.

MC, AVC and AC graphs
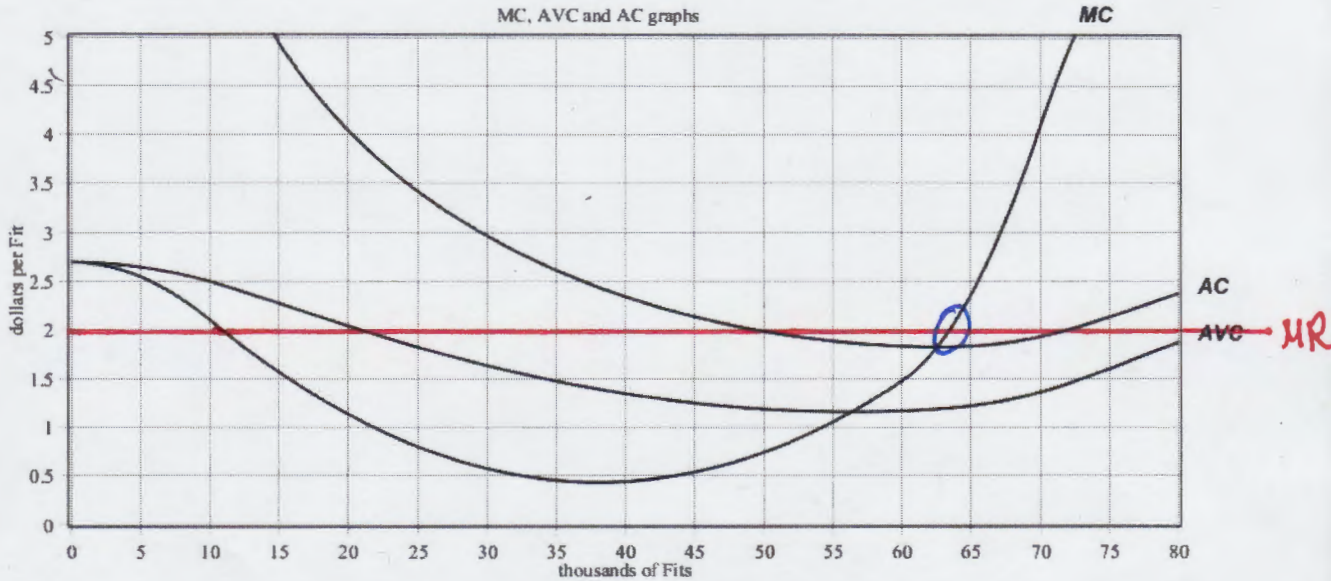
(a) (2 points) What is the Shutdown Price?

When $MC = AVC$ at, $SP \approx \$1.2$

(b) (2 points) If you sell 5000 Fits, do you make a profit or are you at a loss? Explain.

Between $0 + 5000$ Fits, $MR < MC$ so you're at a loss.

(c) (4 points) What is the maximum profit you can make?

when $MR = MC$, switching $MR > MC$ to $MR < MC$.
at 63 thousand Fits
$TR = 63 \times 2 = 126$ thousand
$TC = 63 \times AC \approx 63 \times 1.8 \approx 113.4$ thousand → Profit ≈ 12.6 thousand

(d) (2 points) What is the Fixed Cost?

$FC = TC - VC$
Depends on the { VC at 63 thousand $\approx 63 \times AVC \approx 63 \times 1.2 = 75.6$ thousand
points you
choose + estimation } $FC = TC - VC \approx 113.4 - 75.6 = 37.8$ thousand
errors. The
actual value
was 40 thousand

4

4. The two parts of this question are unrelated.

(a) (4 points) At the beginning of January, I decided to join a gym as part of my new year's resolution. Gym Lean charges 35 dollars per month. Gym Strong charges 20 dollars per month with a sign in fee of 75 dollars. How long should I keep my new year's resolution to make Gym Strong the better deal?

$$35x = 75 + 20x$$
$$15x = 75$$
more than $x = 5$ months

(b) (4 points) Solve for y in terms of x.

$$\frac{5}{y+1} - 3x = \frac{1}{2}$$

$$5 - 3x(y+1) = \frac{y+1}{2}$$

$$10 - 6x(y+1) = y+1$$

$$10 - 6xy - 6x = y+1$$

$$9 - 6x = 6xy + y = (6x+1)y$$

$$\frac{9-6x}{6x+1} = y$$