Math 111, Section B, Winter 2014, Midterm I

February 4, 2014

Name Key

TA/Section

Instructions.

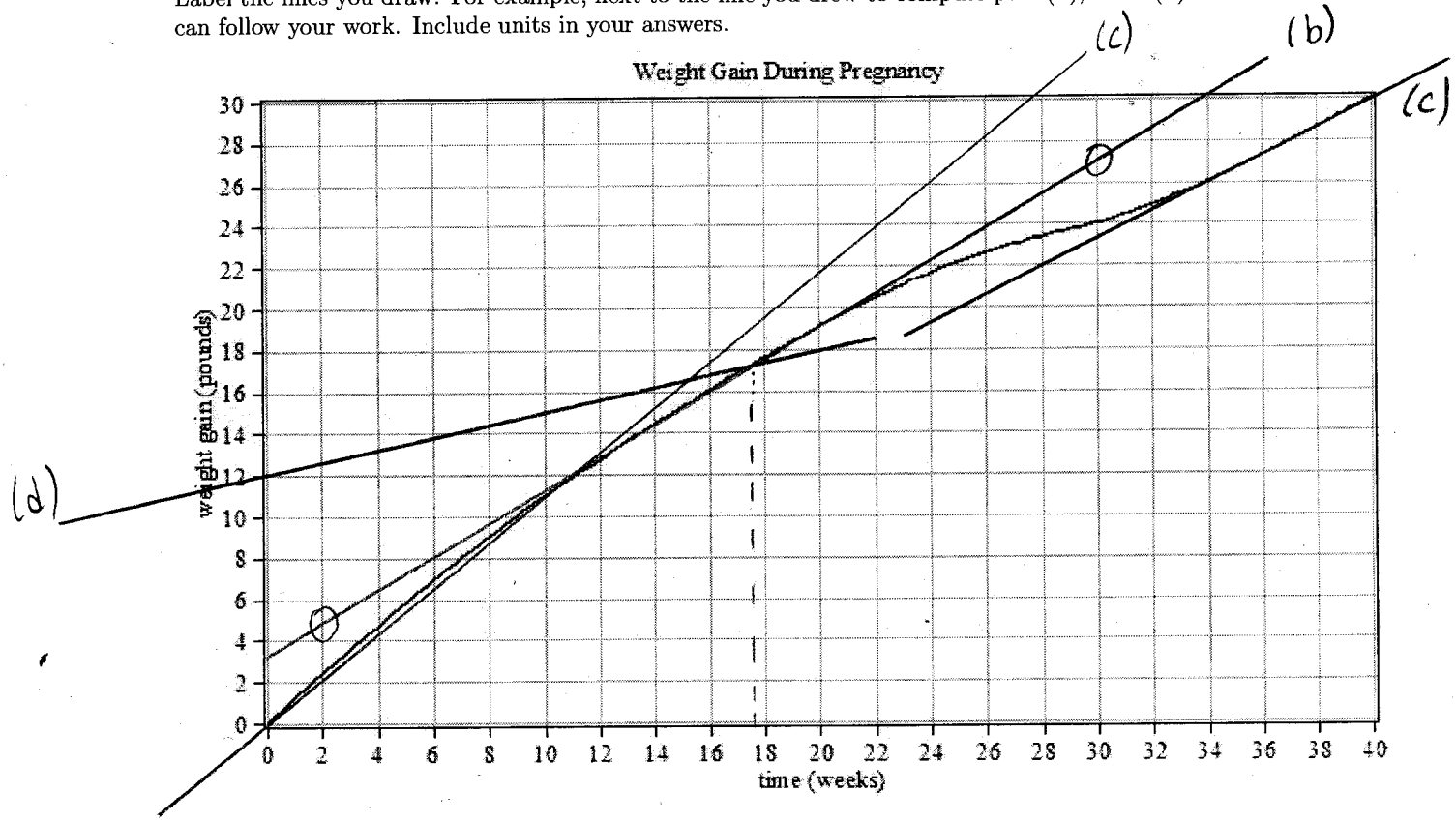
- There are 4 questions. The exam is out of 40 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. It has to be the original and not a photocopy. **Hand in your notes with your exam paper.**
- You may use a calculator which does not graph and which is not programmable.
- In Questions 1, 2 and 3, when you are rounding your answers, use 2 digits after the decimal point.
- **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 $\boxed{\text{BOX}}$ 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. The following is the graph of weight gained by a pregnant woman during the 40 weeks of her pregnancy. 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.



(a) (3 points) What is the Total Rate of Change at $t = 40$ weeks?.

using the point (40,30) slope $= \frac{30}{40} = 0.75$ lbs/week

± 0.05

(b) (3 points) Compute the Average Rate of Change during the 127th day of the pregnancy.

127 days = 18.1 weeks during 127th day: From 126th day to 127th day

126 days = 18 weeks

using the points (2,5) and (30,27) slope $\approx \frac{27-5}{30-2} \approx 0.79$ lbs/week

± 0.10

(c) (1 point) Which one is more? The Average Rate of Change in the first 10 weeks or the Average Rate of Change in the last 10 weeks. You do not have to compute the exact values to answer this question. First 10 weeks

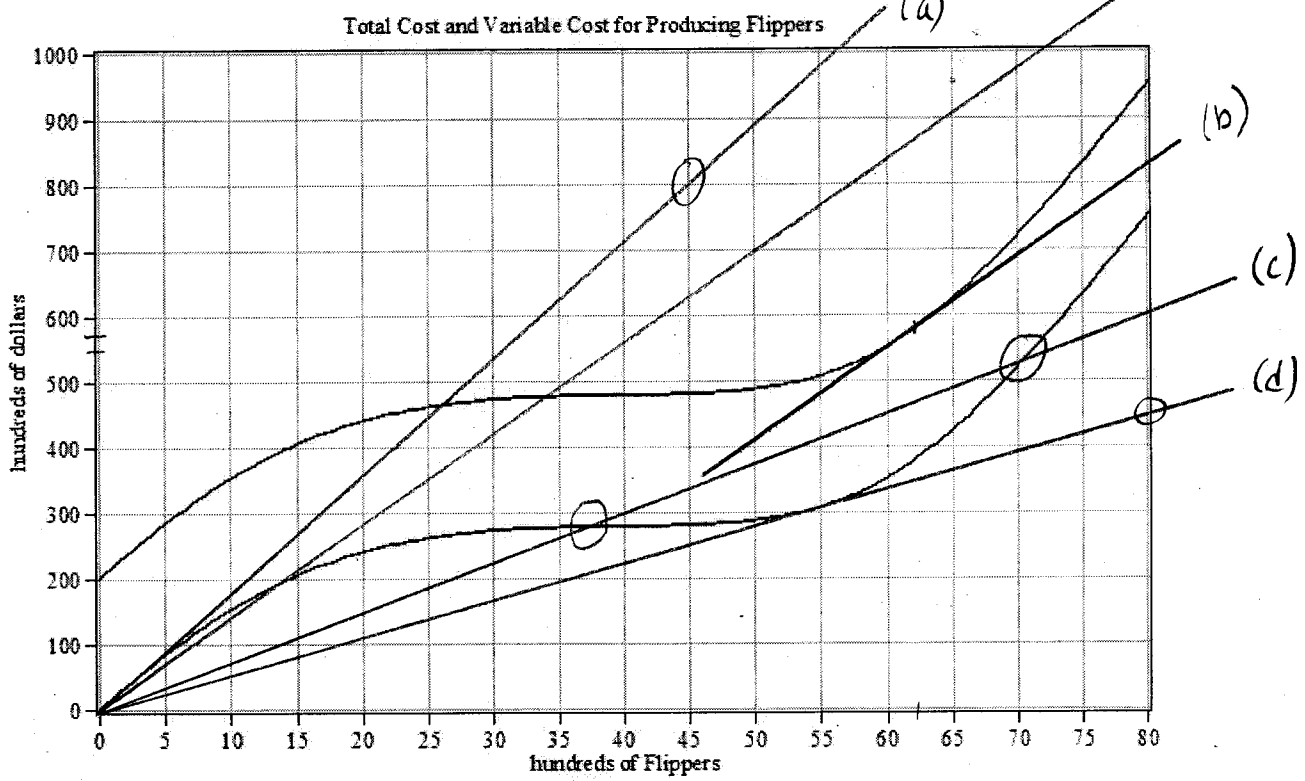
(d) (3 points) The father of the baby gains sympathy weight during the 40 weeks. Initially, he is 12 pounds heavier. He gains weight at a steady rate of 0.3 lbs/week. Graph his weight gain above and estimate the time when the couple have the same weight.

Graph for dad: line through points (0,12) and $(20, 12+20(0.3)) = (20,18)$

about 17.5 weeks

± 0.5

2. You produce and sell Flippers. 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.



(a) (3 points) What is the maximum value of Average Variable Cost?

± 3 dollars/Fl. at the beginning when $q = 1$ using the point $(45, 800)$ slope $= \frac{800}{45} \approx 17.78$ dollars/Flipper

(b) (3 points) At what quantity is the profit maximized if you sell each Flipper for 14 dollars? What is the maximum profit?

± 2 hundred for q
± 50 hundred for TC at q

For TR graph: points $(0,0)$ and $(50, 50 \times 14) = (50, 700)$
at approximately $q \approx 62$ hundred Flippers
$P = 6200 \times 14 - 57500 = 29300$ dollars

(c) (2 points) At what level of production is the Average Variable Cost equal to 7.5 dollars per Flipper?

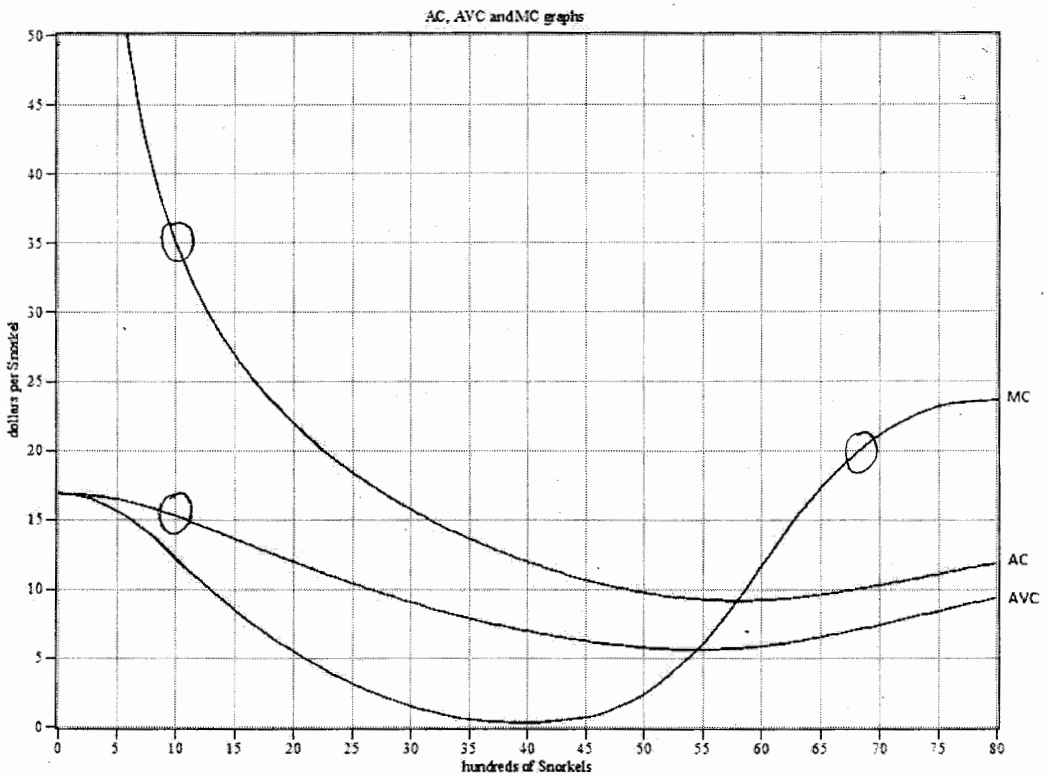
line with slope 7.5 : points $(0,0)$ and $(40, 300)$

± 100 at about 3750 and 7000 Flippers

(d) (2 points) What is the Shutdown Price?

± 0.30 using the point $(80, 450)$ $SP \approx 5.63$ dollars/Flipper

3. You produce and sell Snorkels. Include units in your answers. Round your answers to the nearest dollar



between 8 and 9 (a) (1 point) What is the Breakeven Price? ___9___ dollars/Snorkel MC = AC

between 5.5 and 7 (b) (1 point) What is the Shutdown Price? ___6___ dollars/Snorkel MC = AVC

(c) (4 points) Compute the Fixed Cost. Explain your steps carefully.

±1 dollar/Sn. reading error on AC and AVC

$FC = TC(q) - VC(q)$ at any q

For example, $q = 10$ hundred

$TC(1000) = 1000 \times AC(1000) \approx 1000 \times 35 = 3500$

$VC(1000) = 1000 \times AVC(1000) \approx 1000 \times 15 = 1500$

So $FC \approx 2000$ dollars

(d) (4 points) If you sell each Snorkel for 20 dollars each, what is the maximum profit?

±0.5 on q

±0.5 on $AC(q)$

when $20 = MC$, $q \approx 67$ hundred

$P = 20 \times 6700 - TC(6700)$

$= 20 \times 6700 - 6700 \times AC(6700)$

$\approx 20 \times 6700 - 6700 \times 10 = 67000$ dollars

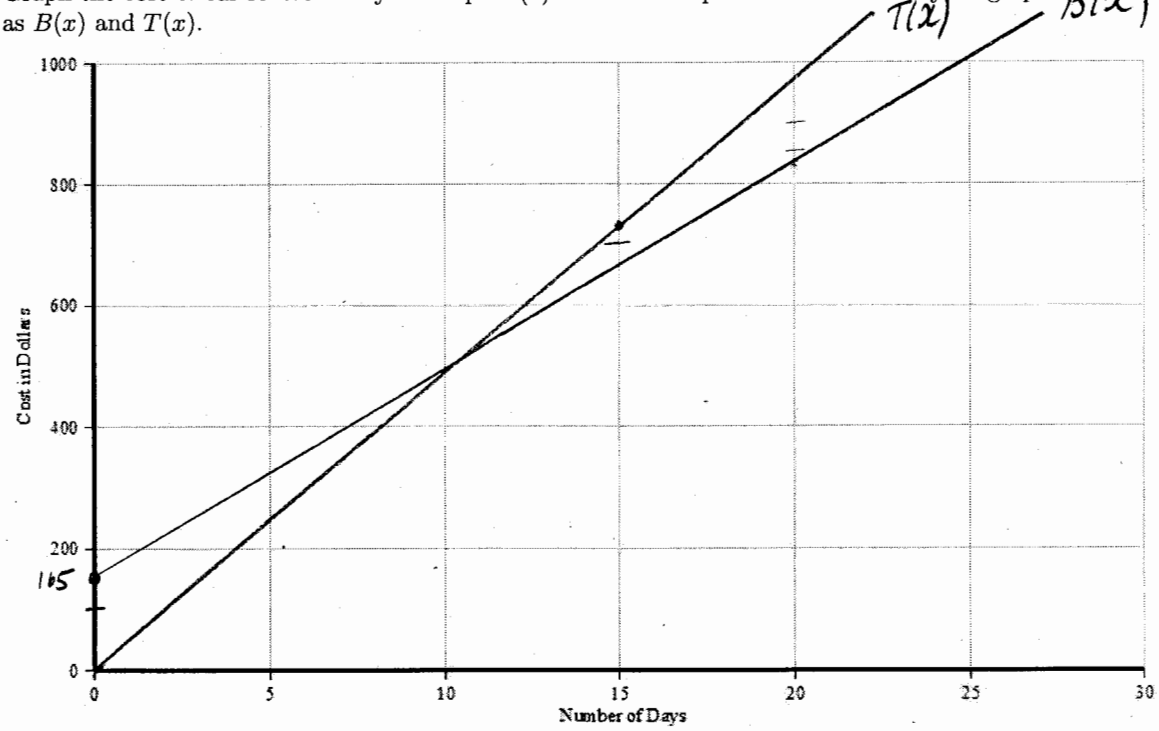
4. Thrifty rents a compact car for \$48 per day, and Budget rents a similar car for \$33 per day plus an initial fee of \$165.

(a) Write equations for the cost of car rental from both companies. Let x be the number of days you keep the car. Let $T(x)$ be the cost if you rent from Thrifty. Let $B(x)$ be the cost if you rent from Budget.

$T(x) =$ $48x$ points $(0,0)$ and $(15,720)$

$B(x) =$ $165+33x$ points $(0,165)$ and $(20,825$

(b) Graph the cost of car rental in days from part (a) for both companies below. Label your graphs as $B(x)$ and $T(x)$.



(c) Use your GRAPHS to ESTIMATE the number of days when both costs are the same.

about 11 days

±1 day

(d) Now, use your EQUATIONS above to determine EXACTLY after how many days would it be cheaper to rent from Budget?

$48x = 165 + 33x$

$15x = 165$

$x = 11$ days