Name:_____ **SID:**_____

GSI name: _____ **Section #:**_____

ECON 100A

MIDTERM I

ANSWER KEY

Instructions

- **BREATHE!**
- The allocated time for the exam is 80 minutes. No extensions will be granted.
- Before you hand in the exam, make sure your name AND SID are at the top of the page, as well as your GSI's name.
- By taking this exam, you acknowledge that the use of outside materials is not permitted. Anyone caught using outside material, including your neighbor's exam, will get 0 points on the exam.
- The use of calculators or pencils is not allowed. Your final answers must be marked with a pen.
- Before you start working, read the questions carefully.
- **If you have any questions, ask!**

GOOD LUCK!

PART I (3 points each)

Mark whether the following statements are true or false. **No explanation needed.**

1. If a good is inferior it cannot be represented with a Cobb-Douglas utility function.

TRUE FALSE

2. The Engel curve for a Giffen good is downward sloping.

TRUE FALSE

3. An increase in income will shift both the uncompensated and compensated demand curves.

TRUE FALSE

4. Joseph likes pumpkin pie better than carrot cake. He is also indifferent between consuming carrot cake and banana bread. His preferences are incomplete.

TRUE FALSE

5. Daniel preferences for Pizza and Sushi can be represented with $U = P^{1/3} \cdot S^{2/3}$. Daniel is spending most of his income on sushi.

TRUE FALSE

6. The change in consumer surplus as a result of a price increase cannot be smaller than equivalent variation.

TRUE FALSE

7. If U = X + Y, then the ratio of prices determines whether good X or good Y are consumed.

TRUE FALSE

8. If Kumar's Willingness-to-pay for burgers is higher than Harold's at any price, his consumer's surplus from consuming burgers is lower than Harold's.

TRUE FALSE

9. Quasi-linear preferences imply that the consumption of only one good depends on income.

TRUE FALSE

10. If the income-consumption curve is back-ward bending, the corresponding Engel curve must be back-ward bending as well.

TRUE FALSE

PART II – SHORT ANSWER QUESTIONS

1. What is the ECONOMIC meaning of the equality $MU_x/p_x = MU_y/p_y$? Explain when it might not be valid (HINT: "marginal utility of X over the price of x equals marginal utility of Y over the price of Y" IS NOT THE ANSWER) (5 points)

The last dollar spent on either good, gives the same level of marginal utility OR the marginal utility per dollar spent on good X is equal to the marginal utility per dollar spent on good Y (3 points).

This means that the slopes of MRS & MRT are equal. This is violated whenever we have corner solution – so quasi-linear, perfect substitutes are valid examples (2 points).

2. Let $U = X^2 + Y^2$. (6 points)
   i. Find the expression for the indifference curve that corresponds to this utility function and graph an indifference curve.

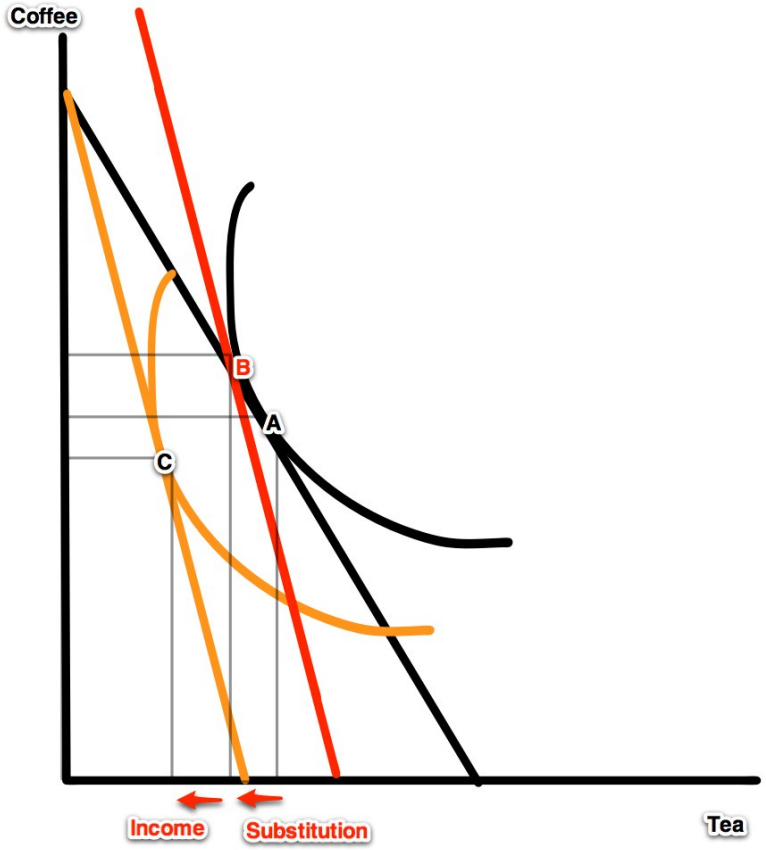
$$Y = \sqrt{\bar{U} - X^2}$$ (2 points for equation)

   ii. Show that this function violates the assumption of diminishing marginal utility (2 points – if just show for one good it's fine)

MUx = 2X
MUy = 2Y

Marginal utility is increasing with quantity

3. Coffee and tea are imperfect substitutes for Jen. The price of tea increases. Graph tea as a normal good. On your graph, clearly mark the income and substitution effects. (7 points)



4. The expenditure function of a Cobb-Douglas utility function can be described as:

$\boldsymbol{E = \overline{U}\left(\frac{P_x}{\propto}\right)^{\propto}\left(\frac{P_y}{1-\propto}\right)^{1-\propto}}$**.** Find the expression for Hicksian demand for good X. Make sure to simplify your answer as much as possible (6 points).

$$\frac{\partial E}{\partial P_x} = \overline{U}\left(\frac{\alpha}{1-\alpha}\cdot\frac{P_y}{P_x}\right)^{1-\alpha}$$

5. What are the three assumptions we made to define rationality? For each assumption, give an example of preferences that violate it (6 points).

Completeness: people may not know how to rank bundles of goods they are unfamiliar with.

Transitivity: give an example of non-transitive preferences

More is better: Alcohol/pizza, pollution

PART III – LONG ANSWER QUESTION (6 parts, 40 points)

Consider preferences over good X and good Y represented by the utility function
$U = X^{1/3}Y^{2/3}$

a. Let Income = 90, P_x = 1.5 and P_y = 2. Find the demand for X & Y. Graph the budget constraint and the optimal bundle that you found.

X* = 1/3*90/1.5 = 20 (2 points) Y* = 2/3*90/2 = 30 (2 points)

3 points for graph

b. Let the price of X increase to 3. Add the new budget constraint to your graph and find the new optimal bundle.

X* = 1/3*90/3 = 10 (2 points) Y* = 30

3 points for graph

c. Find the quantity consumed of X & Y when considering only the substitution effect. (6 points) (Note: the math is a bit messy, so just simplify as much as you can and do not worry about it. Your method of solving this is more important than the final product.)

Use MRS= Px/Py to solve for x or y

MRS= $-\frac{\frac{1}{3}Y}{\frac{2}{3}X}$ = -3/2 (New Price Ratio)

Solving for X= $^{1}/_{3}\,Y$

Now solve for Old Utility:

U=$20^{\frac{1}{3}} * 30^{\frac{2}{3}}$=26.207

Now hold Old Utility constant and plug your X above into the Utility Equation. Solve for Y*

26.207=$(\frac{1}{3}Y)^{\frac{1}{3}}(Y)^{\frac{2}{3}}$

Solve for Y = 37.80

Solve for X= $\frac{1}{3}Y$=12.60

** For this given the complex math – the steps are more important than the actual answer.

The other way you can do it is use the equation in Part 4

$$\frac{\partial E}{\partial P_x} = \overline{U}\left(\frac{\alpha}{1-\alpha}\cdot\frac{P_y}{P_x}\right)^{1-\alpha}$$

$$\frac{\partial E}{\partial P_x} = \overline{26.207}\left(\frac{\left(\frac{1}{3}\right)}{\left(\frac{2}{3}\right)} \cdot \frac{2}{3}\right)^{2/3} = 12.6$$ Then 3*12.6 = Y = 37.8

d. How much income is needed to buy the original bundle you found at the new prices? (6 points)

$120.00

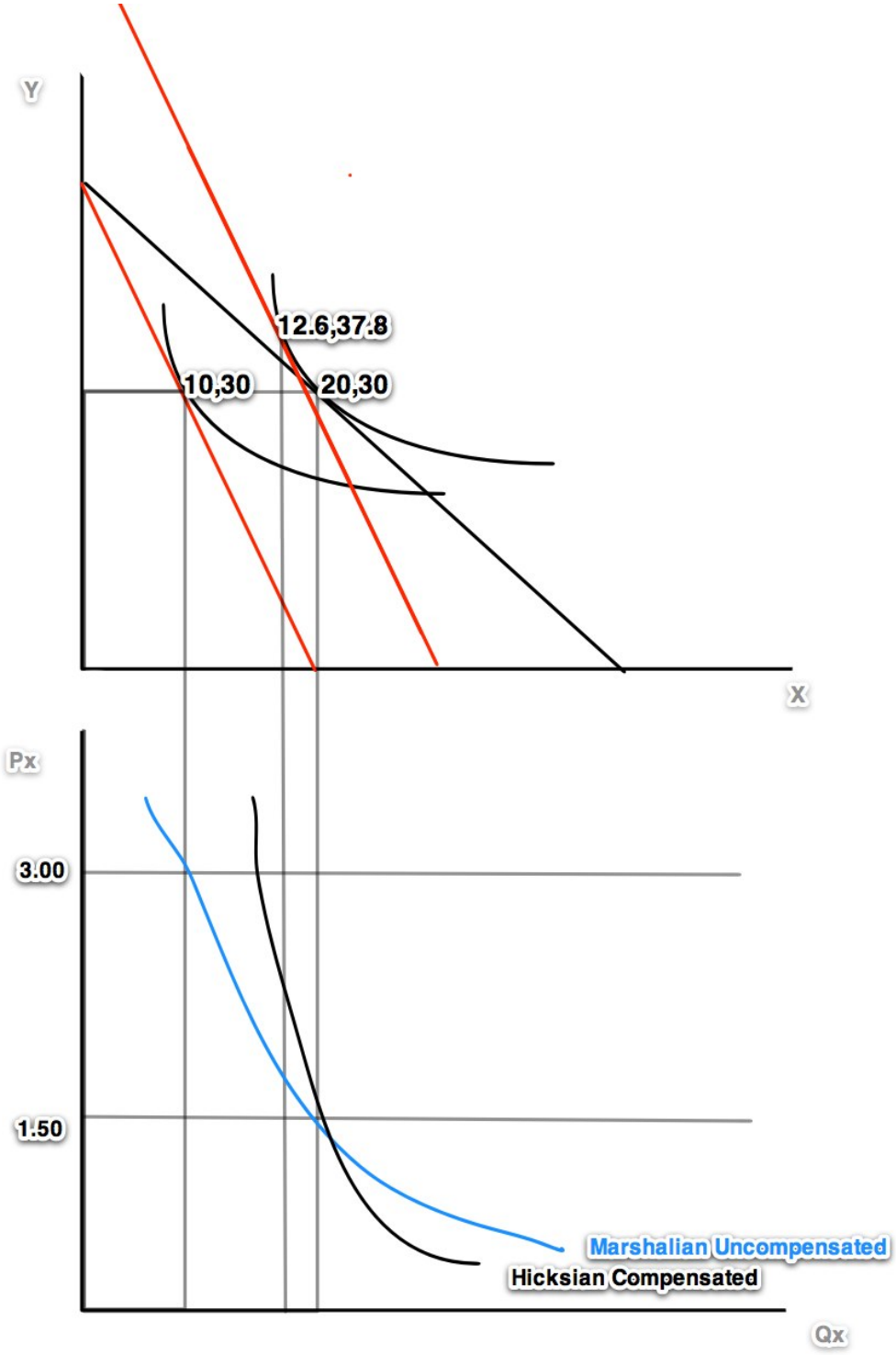
Multiply Price * Quantity for each good to figure out income needed

e. Given the new prices, which bundle would require higher income, the bundle you found in part c or the original bundle? Explain the economic intuition of your answer (6 points).

The original bundle would require a higher income because the bundle found in part c accounts for the substitution and income effects. Because of the change in price, a person would probably not want to consume the original bundle again they would change their consumption patterns.

f. Graph the uncompensated and compensated demand curves corresponding to the three bundles that you found (8 points).

See Below


Y
12.6,37.8
10,30
20,30
X
Px
3.00
1.50
Marshalian Uncompensated
Hicksian Compensated
Qx