Fun Questions for Intermediate Microeconomics (by Anahid Bauer)

Please round all numerical answers to the nearest four decimal places.

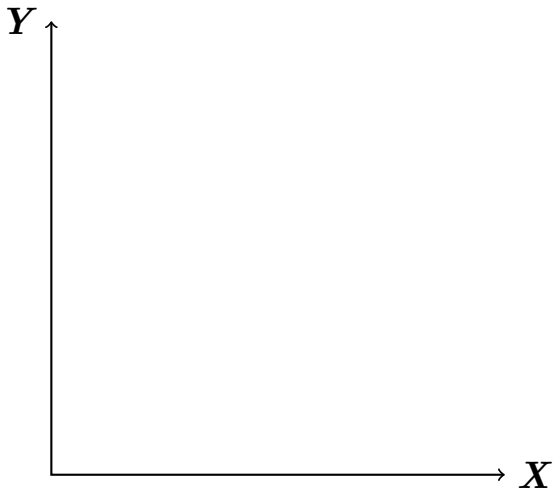
1. The football season just started. Go Illini! You have \$75 in your pocket to allocate between hats (X) and t-shirts (Y) to show your support for the team. The price of a hat is $P_X = \$25$, and the price of a t-shirt is $P_Y = \$15$. Based on your preferences for showing support, your utility function is $U = X^6Y^8$

   (a) What is the expression of your Marginal Utility for t-shirts (Y) ?
   $MU_Y =$_____ (1 point)

   (b) What is the expression of your Marginal Rate of Substitution?
   $MRS =$ _____ (1 point)

2. Pryasmita has been working really hard these lasts months because she wants to buy herself and her siblings the latest smartphone (X) and the latest smartwatch (Y). She managed to save \$15,000 from her work as a computer scientists.

   (a) If the price of a smartwatch is \$300 and the price of a smartphone is \$750, draw her budget line in the following graph. Label all intercepts with its corresponding values and the line as BL1. (1 point)



   (b) In the same graph, draw the new Budget Line if now the price of a smartwatch increases to \$500. Label all intercepts with its corresponding values and the line as BL2. (2 points)

3. Bolin wants to buy his valentine something special this month. Since he doesn't have much money to spend ($30), he is going for something traditional like flowers (X) and chocolates(Y). The price of flowers is $5 and the price of a chocolate box is $3. Bolin's preferences can be represented by $U = 6X^{1/2}Y^{2/3}$

   (a) What is Bolin's Budget Constraint?
   _____ (1 point)

   (b) What is the expression of his Marginal Rate of Substitution?
   $MRS =$ _____ (1 point)

   (c) What is the utility maximizing bundle of X and Y ?
      i. $X =$ _____ (1 point)
      ii. $Y =$ _____ (1 point)

   (d) What is the utility maximizing bundle if on the way to the store Bolin finds an extra $10 bill in his pocket (M=$40)?
      i. $X =$ _____ (1 point)
      ii. $Y =$ _____ (1 point)

4. Santiago started taking ice-skating lessons last week. He wants to learn how to do figures, go backwards and do Mohawks, but he keeps falling because he is freezing on the ice arena. He decided to buy thicker socks (X) and gloves (Y). His budget is $40, and the price of a pair of socks is $5 while the price of a pair of gloves is $10. Santiago's preferences are given by $U = X(Y + 0.5)$

   (a) What is Santiago's Market Rate of Substitution?
   Mkt. R.S. = _____ (1 point)

   (b) What is the expression of his Marginal Rate of Substitution?
   $MRS =$ _____ (1 point)

   (c) What is the utility maximizing bundle of X and Y Santiago will buy?
      i. $X =$ _____ (1 point)
      ii. $Y =$ _____ (1 point)

5. Katara, Sokka and Aang are visiting a village of earth-benders. After saving the people from a gigantic water spider they receive 2000 silver coins. Since Katara knows how to administer the money better, they decide to put her in charge of buying food. Katara's preferences are given by $U = 4X^{5/4}Y^{3/4}$, where X is fish and Y is vegetables.

(a) Find Katara's demand functions

i. $X =$_____ (1 point)

ii. $Y =$_____ (1 point)

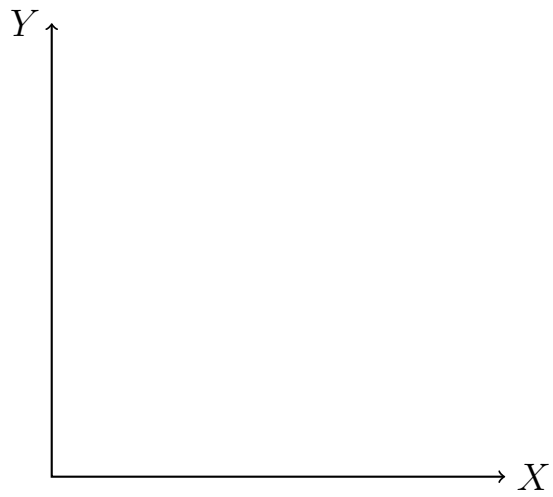
(b) Complete the following chart with the corresponding optimal bundles: (3 points)

Bundle	p_X	p_Y	M	X	Y
A	10	20	2000	_____	_____
B	20	20	2000	_____	_____
C	40	20	2000	_____	_____

(c) In the following graph, draw the corresponding budget lines (BL1), (BL2), and (BL3), the optimal bundles (A), (B) and (C) and the indifference curves (I1), (I2), (I3). Place all corresponding intercepts and labels.
Draw the Price-consumption curve and label it. (3 points)

6. Ferb and Phineas have \$300 to spend over their winter vacations. They can either buy wood (X) to construct a super fast flying sled or spend their money on clothes (Y) for their pet Perry.

   (a) Since they bought lots of wood during the summer for their inventions, they got a coupon from the wood store, which gives them 10 free cords if they buy 5 cords. This is good for one use only (i.e. limit 10 free cords per coupon, and they only have one coupon). The price of a cord of wood (P_X) is \$15 and the price of pet's clothes (P_Y) is \$5. Use the graph below to draw Ferb and Phineas's budget line, BL. Be sure to label the points where the line intersects the X and the Y axes as well as all the reference points. (2 points)



   (b) Now assume Ferb and Phineas' preferences are represented by the utility function $U = XY$.

      i. Find the optimal bundle of wood and clothes they would consume in the absence of the coupon.
      X= _____
      Y= _____ (1 point)

      ii. Find the optimal bundle of wood and clothes they will consume given that they do have the coupon.
      X= _____
      Y= _____ (1 point)

      iii. In the graph above, assuming that they do have the coupon, draw the indifference curve (I) and label the optimal bundle (A) with all reference points. (1 point)

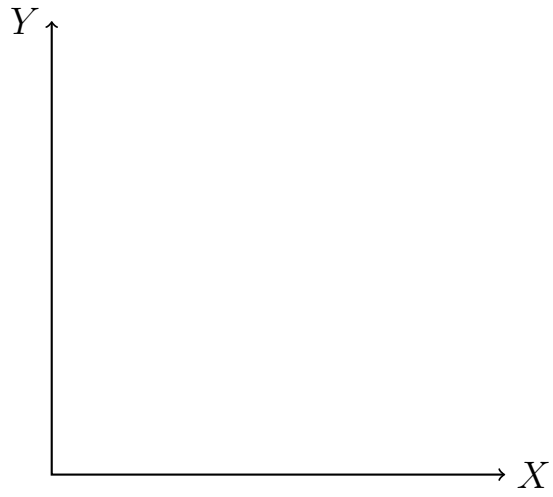
7. Mariano loves drinking cups of tea (X) with spoons of milk (Y). He considers them perfect complements, and always has 1 cup of tea with exactly 4 spoons of milk, 2 cups of tea with 8 spoons of milk, 3 cups of tea with 12 spoons of milk, etc.

   (a) Suppose the price of X is \$2 and the price of Y is \$1 and Mariano's budget is \$6. How much milk and tea will he consume? (1 point)

   i. $X =$ _____

   ii. $Y =$ _____

   (b) Draw Mariano's budget line (BL), his indifference curve (I), and optimal bundle (A), with all the reference points. (1 point)



   (c) EXTRA CREDIT: Let the price of a cup of tea be P_X, the price of a spoon of milk P_Y and Mariano's income M. Find the demand function for tea, $X = f(P_X, P_Y, M)$
   $X(P_X, P_Y, M) =$ _____ (2 (bonus))

8. EXTRA CREDIT: After moving to the big city, you decide it is a great idea to start producing alcohol-free craft beer. It makes sense, while living in Chambana all your friends loved your product. Your production function is $q = L^{1/2}K^{1/4}$, where q is liters of beer, L is labor in hours and K is hours of rented brewing equipment. An hour of labor costs \$15 and renting brewing equipment costs \$10 per hour. Write the Lagrangian equation if you want to produce 200 liters of beer.
   $\mathcal{L} =$_____ (2 (bonus))

Answer Key for Fun Questions

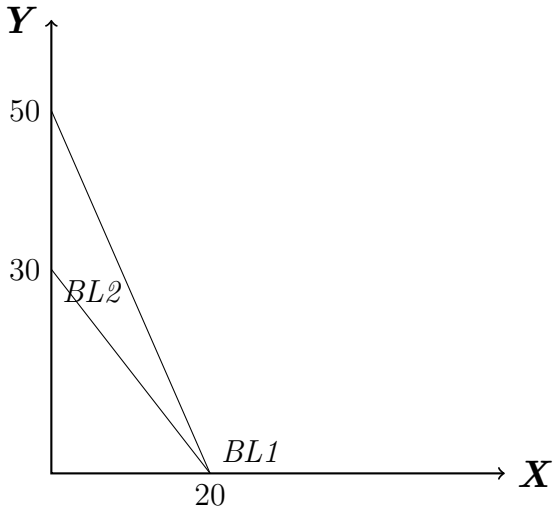
1. The football season just started. Go Illini! You have \$75 in your pocket to allocate between hats (X) and t-shirts (Y) to show your support for the team. The price of a hat is $P_X = \$25$, and the price of a t-shirt is $P_Y = \$15$. Based on your preferences for showing support, your utility function is $U = X^6Y^8$

   (a) What is the expression of your Marginal Utility for t-shirts (Y) ?
   $MU_Y =$ $8X^6Y^7$ (1 point)

   (b) What is the expression of your Marginal Rate of Substitution?
   $MRS =$ $3Y/4X$ (1 point)

2. Pryasmita has been working really hard these lasts months because she wants to buy herself and her siblings the latest smartphone (X) and the latest smartwatch (Y). She managed to save \$15,000 from her work as a computer scientists.

   (a) If the price of a smartwatch is \$300 and the price of a smartphone is \$750, draw her budget line in the following graph. Label all intercepts with its corresponding values and the line as BL1. (1 point)



   (b) In the same graph, draw the new Budget Line if now the price of a smartwatch increases to \$500. Label all intercepts with its corresponding values and the line as BL2. (2 points)

3. Bolin wants to buy his valentine something special this month. Since he doesn't have much money to spend ($30), he is going for something traditional like flowers (X) and chocolates(Y). The price of flowers is $5 and the price of a chocolate box is $3. Bolin's preferences can be represented by $U = 6X^{1/2}Y^{2/3}$

   (a) What is Bolin's Budget Constraint?
   $5X + 3Y = 30$ (1 point)

   (b) What is the expression of his Marginal Rate of Substitution?
   $MRS =$ $3Y/4X$ (1 point)

   (c) What is the utility maximizing bundle of X and Y ?
      i. $X =$ 2.5714 (1 point)
      ii. $Y =$ 5.7143 (1 point)

   (d) What is the utility maximizing bundle if on the way to the store Bolin finds an extra $10 bill in his pocket (M=$40)?
      i. $X =$ 3.4286 (1 point)
      ii. $Y =$ 7.6190 (1 point)

4. Santiago started taking ice-skating lessons last week. He wants to learn how to do figures, go backwards and do Mohawks, but he keeps falling because he is freezing on the ice arena. He decided to buy thicker socks (X) and gloves (Y). His budget is $40, and the price of a pair of socks is $5 while the price of a pair of gloves is $10. Santiago's preferences are given by $U = X(Y + 0.5)$

   (a) What is Santiago's Market Rate of Substitution?
   Mkt. R.S. = 0.5 (1 point)

   (b) What is the expression of his Marginal Rate of Substitution?
   $MRS =$ $(Y + 0.5)/X$ (1 point)

   (c) What is the utility maximizing bundle of X and Y Santiago will buy?
      i. $X =$ 4.5 (1 point)
      ii. $Y =$ 1.25 (1 point)

5. Katara, Sokka and Aang are visiting a village of earth-benders. After saving the people from a gigantic water spider they receive 2000 silver coins. Since Katara knows how to administer the money better, they decide to put her in charge of buying food. Katara's preferences are given by $U = 4X^{5/4}Y^{3/4}$, where X is fish and Y is vegetables.

(a) Find Katara's demand functions

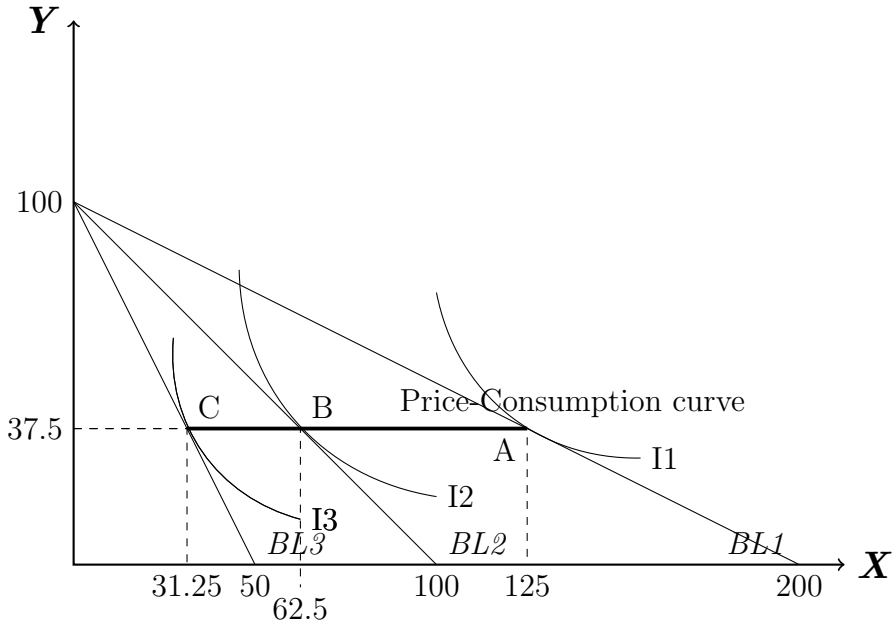
i. $X =$ $5M/8p_X$ (1 point)

ii. $Y =$ $3M/8p_Y$ (1 point)

(b) Complete the following chart with the corresponding optimal bundles: (3 points)

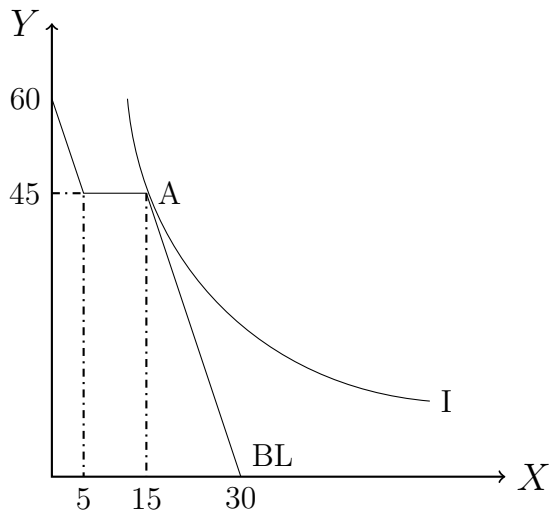
Bundle	p_X	p_Y	M	X	Y
A	10	20	2000	**125**	**37.5**
B	20	20	2000	**62.5**	**37.5**
C	40	20	2000	**31.25**	**37.5**

(c) In the following graph, draw the corresponding budget lines (BL1), (BL2), and (BL3), the optimal bundles (A), (B) and (C) and the indifference curves (I1), (I2), (I3). Place all corresponding intercepts and labels.
Draw the Price-consumption curve and label it. (3 points)



6. Ferb and Phineas have \$300 to spend over their winter vacations. They can either buy wood (X) to construct a super fast flying sled or spend their money on clothes (Y) for their pet Perry.

   (a) Since they bought lots of wood during the summer for their inventions, they got a coupon from the wood store, which gives them 10 free cords if they buy 5 cords. This is good for one use only (i.e. limit 10 free cords per coupon, and they only have one coupon). The price of a cord of wood (P_X) is \$15 and the price of pet's clothes (P_Y) is \$5. Use the graph below to draw Ferb and Phineas's budget line, BL. Be sure to label the points where the line intersects the X and the Y axes as well as all the reference points. (2 points)



   (b) Now assume Ferb and Phineas' preferences are represented by the utility function $U = XY$.

      i. Find the optimal bundle of wood and clothes they would consume in the absence of the coupon.
      X= 10
      Y= 30 (1 point)

      ii. Find the optimal bundle of wood and clothes they will consume given that they do have the coupon.
      X= 15
      Y= 45 (1 point)

      iii. In the graph above, assuming that they do have the coupon, draw the indifference curve (I) and label the optimal bundle (A) with all reference points. (1 point)

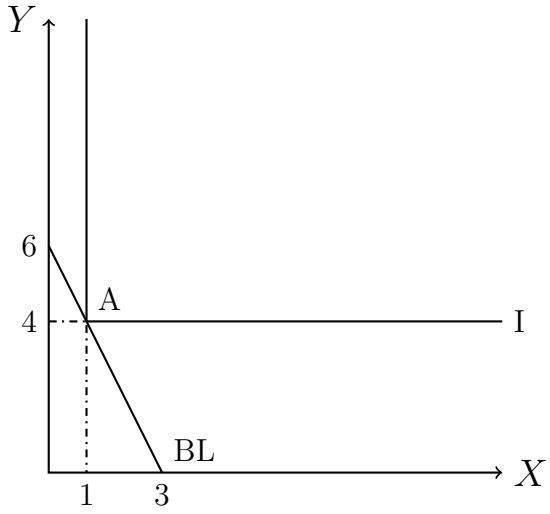
7. Mariano loves drinking cups of tea (X) with spoons of milk (Y). He considers them perfect complements, and always has 1 cup of tea with exactly 4 spoons of milk, 2 cups of tea with 8 spoons of milk, 3 cups of tea with 12 spoons of milk, etc.

   (a) Suppose the price of X is \$2 and the price of Y is \$1 and Mariano's budget is \$6. How much milk and tea will he consume? (1 point)

   i. $X =$ 1

   ii. $Y =$ 4

   (b) Draw Mariano's budget line (BL), his indifference curve (I), and optimal bundle (A), with all the reference points. (1 point)



   (c) EXTRA CREDIT: Let the price of a cup of tea be P_X, the price of a spoon of milk P_Y and Mariano's income M. Find the demand function for tea, $X = f(P_X, P_Y, M)$
   $X(P_X, P_Y, M) = M/(P_X + 4P_y)$ (2 (bonus))

8. EXTRA CREDIT: After moving to the big city, you decide it is a great idea to start producing alcohol-free craft beer. It makes sense, while living in Chambana all your friends loved your product. Your production function is $q = L^{1/2}K^{1/4}$, where q is liters of beer, L is labor in hours and K is hours of rented brewing equipment. An hour of labor costs \$15 and renting brewing equipment costs \$10 per hour. Write the Lagrangian equation if you want to produce 200 liters of beer.
   $\mathcal{L} =$ $15L + 10K + \lambda(200 - L^{1/2}K^{1/4})$ **or** $\mathcal{L} = 15L + 10K - \lambda(L^{1/2}K^{1/4} - 200)$ (2 (bonus))