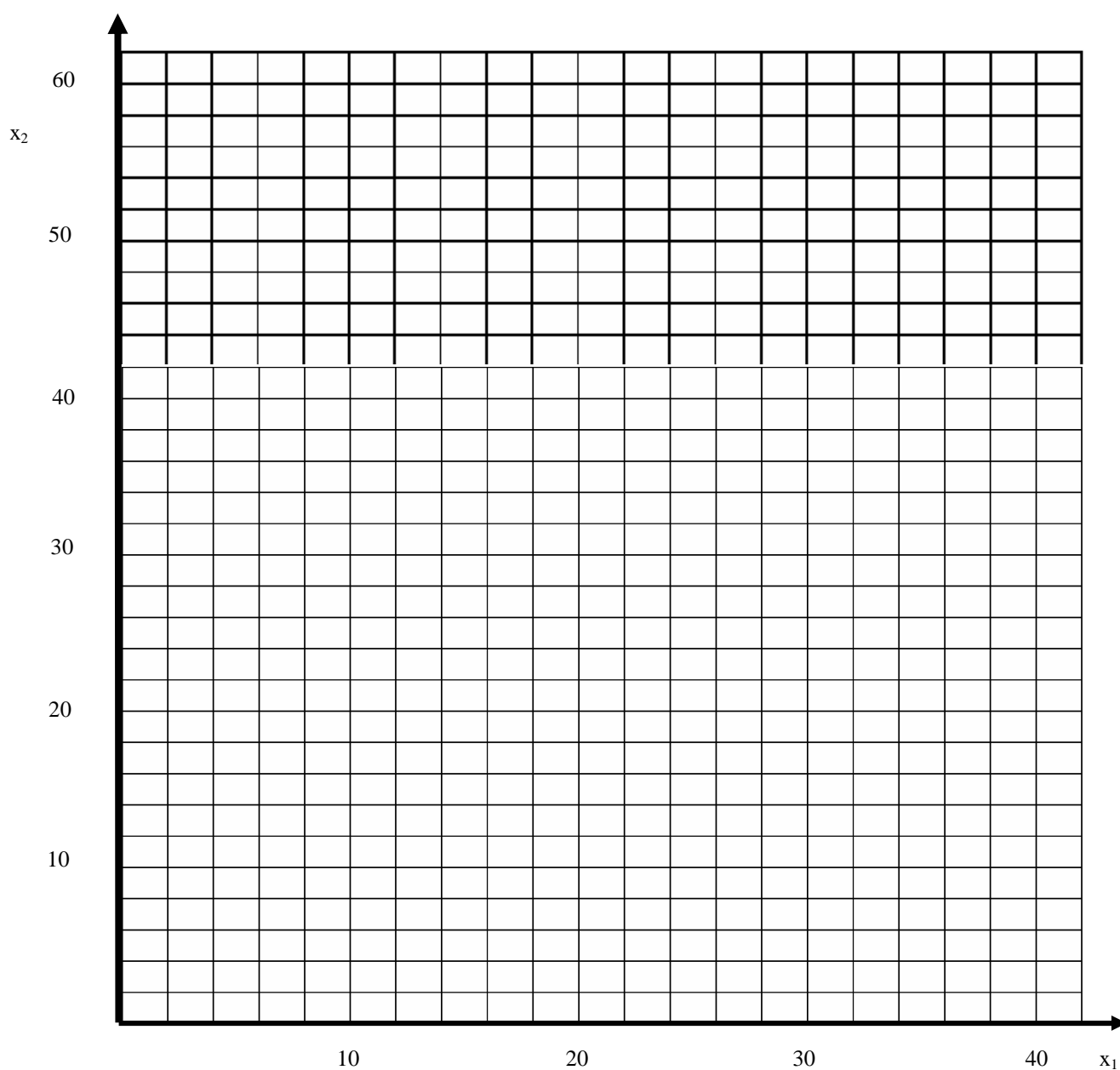


## Practice Midterm Exam 1

1. (32 Points) Charlie is a Cobb-Douglas consumer. His utility function is  $u(x_1, x_2) = 2x_1^3x_2^5$ .

a) Find his individual demand function for each good by using the Lagrange method. Use  $p_1x_1 + p_2x_2 = m$  for the budget line.

b) Now use the following values:  $m=160$ ,  $p_1=3$  and  $p_2=4$ . Find his initial consumption bundle A and mark it in the graph below:



c) Assume that price of good 1 now increases  $p_1' = 5$ . Find Charlie's Slutsky income compensation that he needs to receive to still be able to consume bundle A at new prices.

d) Find his compensated bundle B and his final bundle at new prices and original income. Marke the bundles in the graph above.

e) Write down the Slutsky equation including substitution and income effect and compute both effects. Mark them in the diagram above. You need to mark it along the correct axis and with the correct length and direction.

**2. (28 Points)** A consumer has preferences that follow the function  $u(x_1, x_2) = (x_1 + 10)x_2$

(a) Find her optimal demand functions using the general expression for the budget line  $p_1x_1 + p_2x_2 = m$  by using the Lagrange method.

(b) Use the individual demand functions that you found in (a) to plug in the following values:  $p_1 = 3, p_2 = 4, m = 70$ . Call this point "A". Find the consumer's utility in A.

(c) Compute and draw the Engel curves for each good. Use one for each good and label the axes. Do the Engel curves differ from Engel curves of Cobb-Douglas demands? If so, how?



**3. (19 Points)** Sketch the following indifference curves of an individual consuming two commodities: chocolate cookies and muffins. Always label the axes and briefly explain what's the special property of these indifference curves.

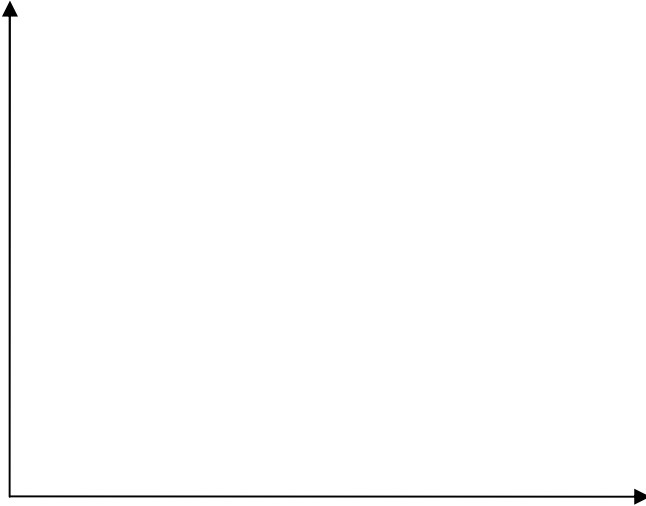
(a) Abby loves muffins but does not care about chocolate cookies. She always prefers muffins, independent of the number of chocolate cookies she is offered.



(b) Betsy is indifferent between two bundles that contain at least 3 chocolate cookies OR 3 muffins. Her preferences do not change should she consume additional units of any of the two goods in combination.



(c) Her sister Connie is indifferent between two bundles that contain at least 4 chocolate cookies AND 2 muffins. Her preferences do not change should Lisa consume additional units of any of the goods in combination.



(d) Debbie prefers muffins and chocolate cookies only in the following combination: Any 2-4 muffins together with 3-5 chocolate cookies give her the same utility, otherwise her utility is zero.



(e) Emily likes muffins. She unfortunately is allergic to chocolate cookies. If you want her to eat a chocolate cookie, you need to compensate her by giving her 0.75 muffins. Draw the indifference curves and the slope triangle. Compute her MRS.



**4. (21 Points)** Charlize has a utility function of  $u(x_1, x_2) = 2\sqrt{x_1} + x_2$ . Assume  $p_1$  and  $p_2$  to be positive.

- a) Algebraically solve Charlize's optimization problem using the Lagrange method.
- b) By using the appropriate derivative, write down the definition for substitutes and complements. Show by using the individual demand function of good 1 why the two goods are substitutes.
- c) Draw value tables for the utility levels  $u = 18$ ,  $u = 22$ , and  $u = 30$  and draw the relative indifference curves belonging to these three utility levels into the graph below. (Hint: To simplify this task it should be sufficient here to for each of the three given utility levels the function values  $x_2(x_1)$  by using the following values for  $x_1$ : 0,1,4,9,16,25,36).

