

Name:

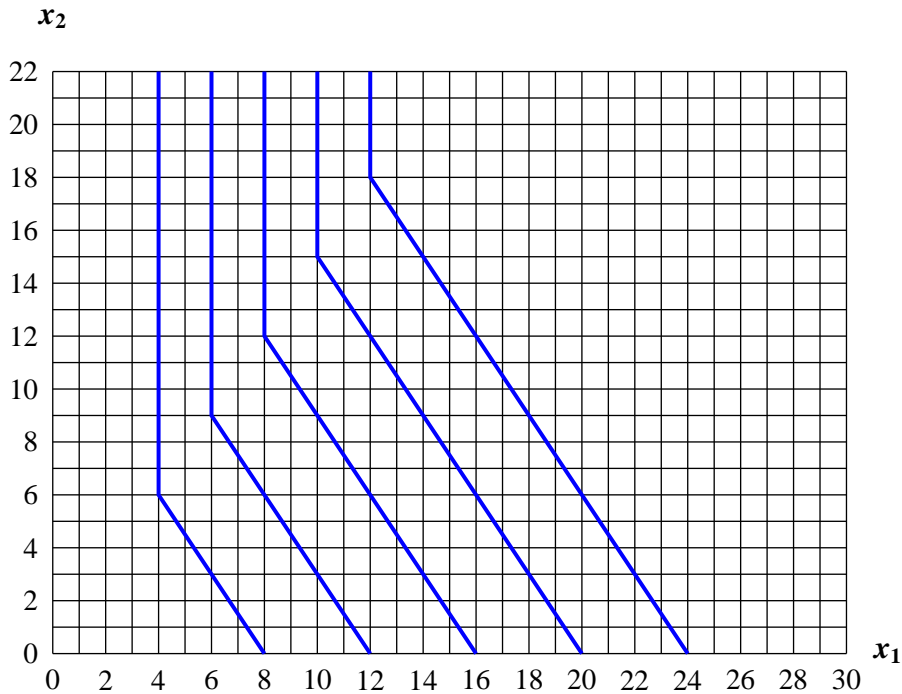
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**All questions must be answered on this test form!**

For each question you must show your work and (or) provide a clear argument.

All graphs must be accurate to get credit.

**Question 1** Consumer preferences are depicted below:



1. Suppose that (10, 9) is the optimal consumption and that  $p_2 = 30$ .

Then  $p_1 =$  ,  $I =$  . 5 points

2. Suppose prices are  $p_1 = 1$ ,  $p_2 = 3$ . Then the minimum amount of income the person needs to get the same utility as (8, 14) is given by  $I =$  .

5 points

3. Suppose that  $I = 18$ ,  $p_1 = 3$  and  $p_2 = 1$ . Then the optimal consumption is

$x_1 =$  ,  $x_2 =$  . 5 points

**Question 2** Demand is given by  $Q_D(P) = 300 - 2P$ , and supply is  $Q_S(P) = 60 + P$ .

- (a) Suppose that the government imposes a tax of 30 Dollars per unit on the good, raising the price for buyers from  $P$  to  $P + 30$ . Then

**the government's tax revenue is**

*5 points*

- (b) In addition to the tax the government also pays a subsidy of  $s = 30$  Dollars to producers, raising the price for producers to  $P + 30$ . Then:

*5 points*

**the government's tax revenue is**

**the government's total subsidy payments are**

- (c) Now suppose that the government wants to provide a subsidy  $s$  to producers and not tax on buyers. The subsidy  $s$  should be chosen such that the price  $P$  that consumers pay is 60. Determine  $s$  (note that if  $s$  is changed, the equilibrium value of  $P$  changes).

**The subsidy is  $s =$**

*5 points*

**Question 3**

- (a) Suppose supply is linear. At a price of  $P = 10$  supply is 100 units. The price elasticity of supply at  $P = 10$  is  $\epsilon_D = 0.5$ . Then the supply function is given by

$$Q_S(P) =$$

*5 points*

- (b) Suppose the demand function is given by  $Q_D(P) = 20 - 4P$ . Determine the price  $P$  at which demand is unit elastic, i.e., the price elasticity of demand is  $-1$ .

$$P =$$

*5 points*

- (c) Suppose that the demand function is linear. Demand is unit elastic (i.e., the price elasticity is  $-1$ ) at  $P = 30$ . At a price of  $P = 10$  demand is  $Q = 100$ . Determine the demand function.

$$Q_D(P) =$$

*5 points*

**Question 4** Suppose preferences are given by  $u(x_1, x_2) = \min\{2x_1, x_2\}$ . Prices are given by  $p_1 = 3, p_2 = 1$ . Income is  $I = 30$ . In both cases below you must draw the budget line (iso cost curve) and the indifference curve through the solution.

(a) Determine the optimal consumption graphically.

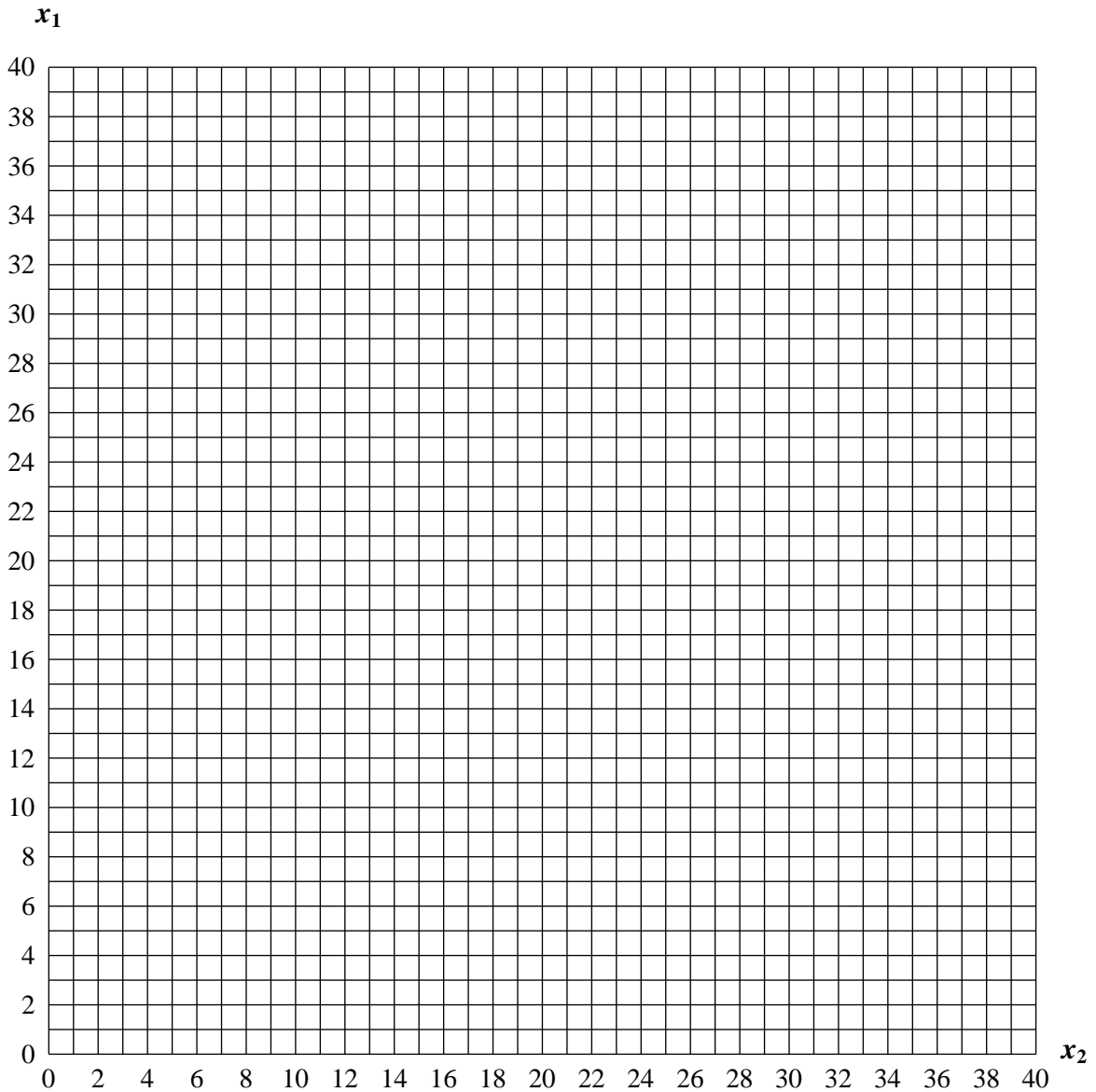
5 points

The optimum is  $x_1 =$   ,  $x_2 =$  .

(b) Determine graphically the least costly consumption choice that gives the same utility as (3, 9) at prices  $p_1 = 4, p_2 = 3$ .

5 points

$x_1 =$   ,  $x_2 =$  .



**Question 5** Solve the following optimization problem

$$\min_{x_1, x_2} 3x_1 + x_2 \text{ subject to}$$

(i)  $x_1 + x_2 \geq 26$

(ii)  $2x_2 - x_1 \geq 10$

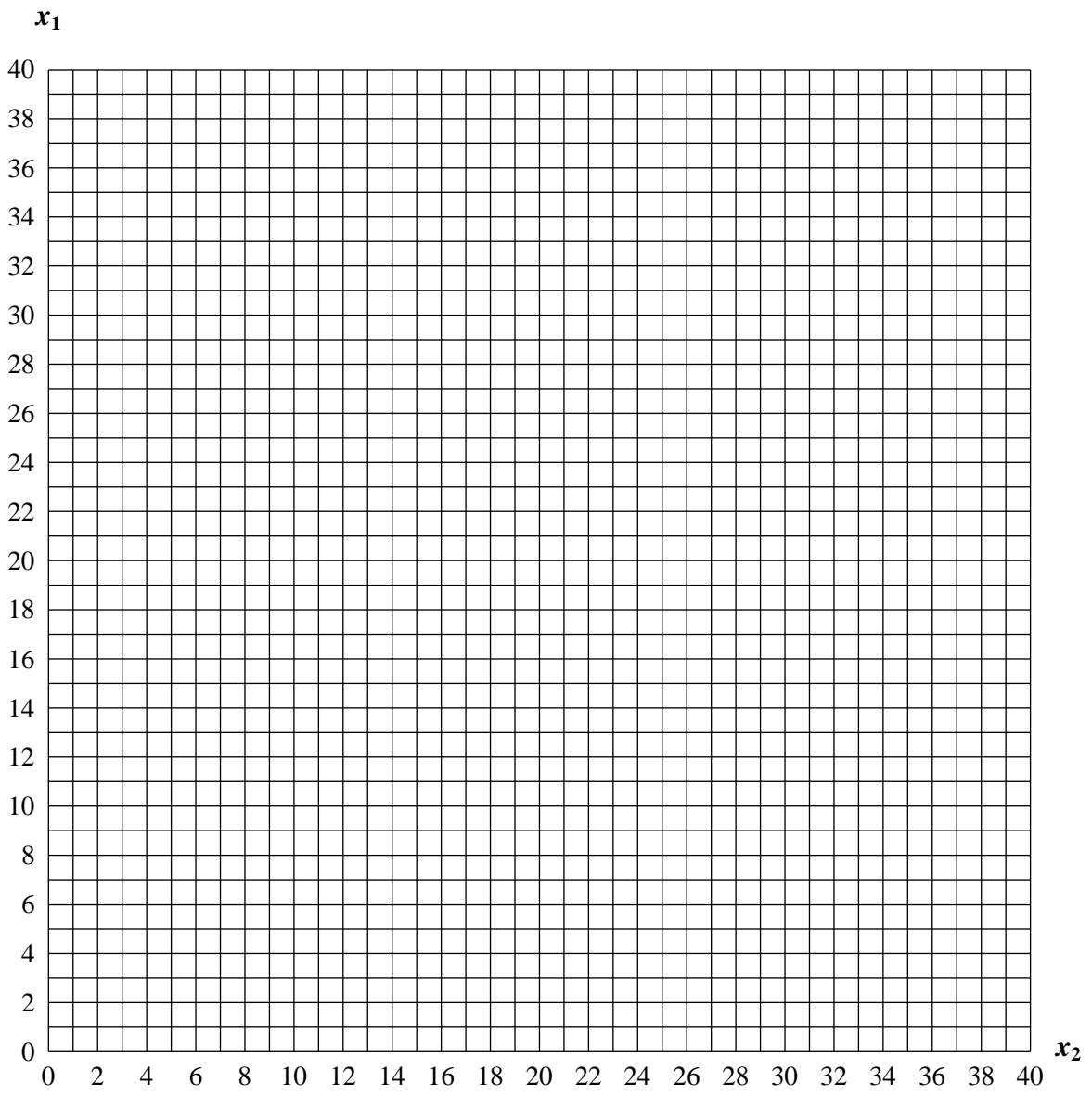
(iii)  $4x_1 + x_2 \geq 44$

(iv)  $x_1 + 3x_2 \geq 42$

Determine the optimum graphically. *Indicate the feasible set by shading it!*

15 points

<b>At an optimum <math>x_1 =</math></b>	<b><math>x_2 =</math></b>
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**Question 6** A utility function is given by  $u(x_1, x_2) = \min\{x_1 + 3x_2, 3x_1 + x_2\}$ . Suppose prices are  $p_1 = 1$  and  $p_2 = 4$ . The person's income is  $I = 40$ . The government introduces a tax of 3 Dollars on each unit of good 1, which raises the price of good 1 to  $p_1 = 4$ .

Use the grid on the next page to answer the following questions. In all cases below you must graph the indifference curve and the budget line through the solution point.

Then:

*15 points*

**Before-tax demand is  $x_1 =$   $x_2 =$**

We now want to determine the loss of the consumer due to the tax. In particular, consider the after tax price  $p_1 = 4$ , and  $p_2 = 4$ . The least costly consumption bundle that gives the consumer the before tax utility at after-tax prices is

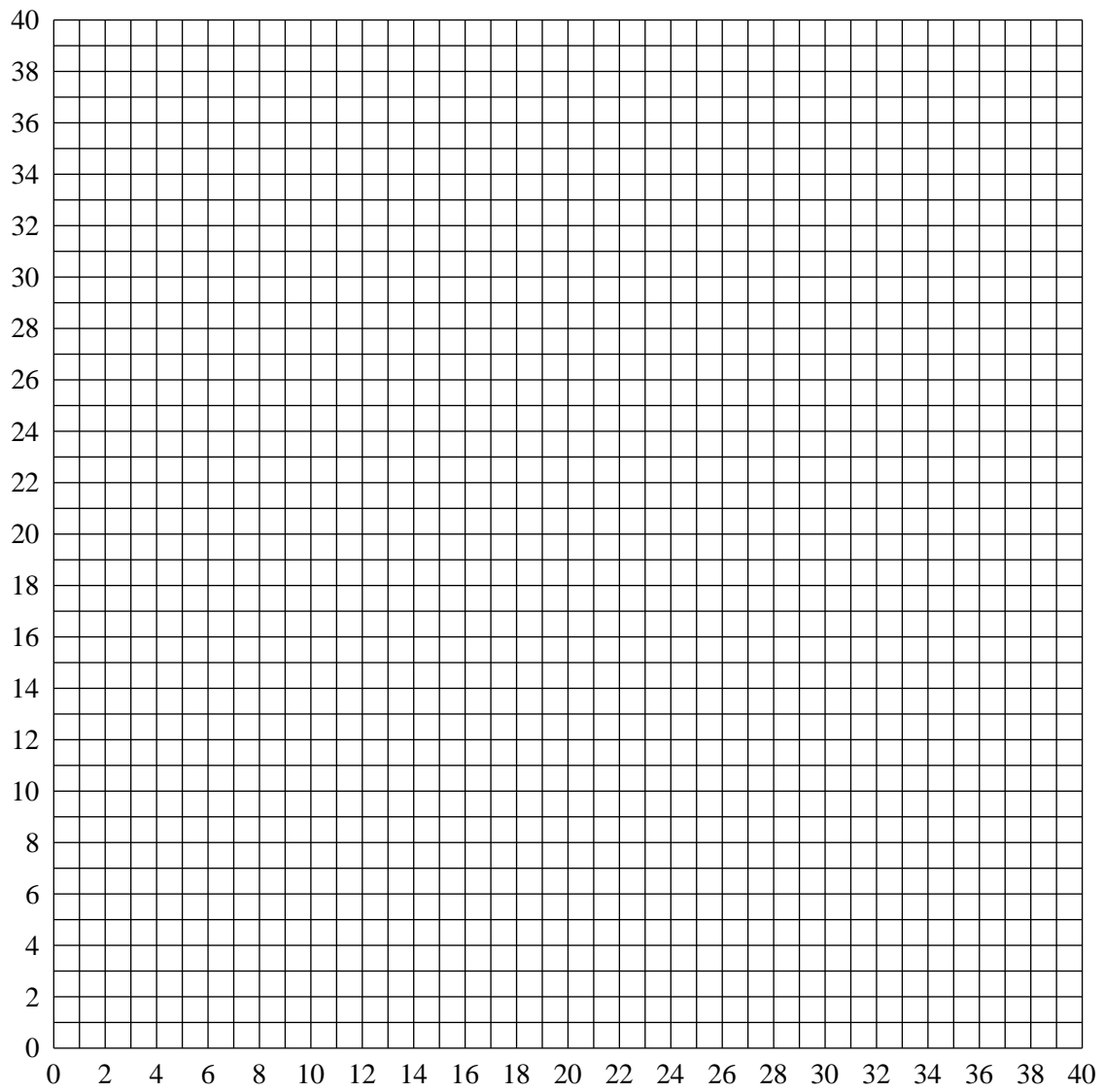
**$x_1 =$   $x_2 =$**

**and the cost of this consumption bundle (at after-tax prices) is**

**which would require a subsidy of to the consumer**

**After the subsidy is introduced, the government's tax revenue is**

**The deadweight loss of the tax is therefore**



**Question 7** Suppose there are two goods. The price of good 2 is 1. The price of good 1 is non-linear, i.e., it depends on the quantity consumed. In particular, the first 10 units of good 1 cost 2 Dollars per unit. Every additional unit costs 50cents. The person has an income  $I = 30$ . Preferences are given by  $u(x_1, x_2) = \min\{x_1, 3x_2\}$ .

*Use the grid on the next page to answer the following questions. You must clearly indicate the budget set by shading it and graph the indifference curve through the solution.*

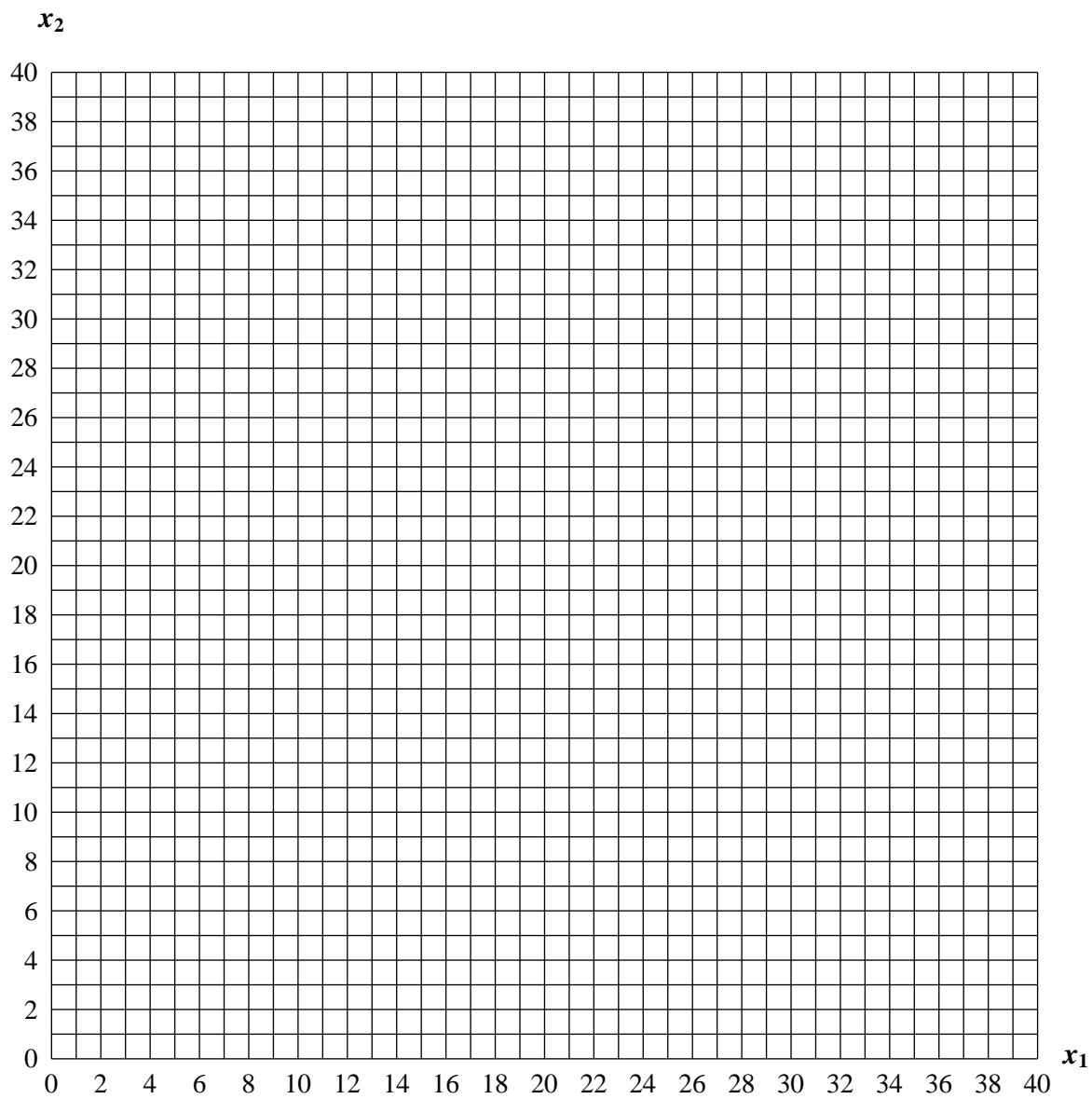
**The optimal consumption is  $x_1 =$                        $x_2 =$**

*5 points*

Suppose that instead of the non-linear price, good 1 is now sold at a linear price  $p'_1$  (i.e., the price per unit is no independent of the quantity purchased). Determine the price of good 1,  $p'_1$ , at which the consumer would be indifferent between the linear and the non-linear pricing.

**$p'_1 =$**

*5 points*



**Question 8** Preferences are depicted below.

Suppose that prices are  $p_1 = 1$ ,  $p_2 = 2$  and income is  $I = 30$ . Then

**optimal consumption is  $x_1 =$  \_\_\_\_\_ ,  $x_2 =$  \_\_\_\_\_**

Suppose that prices are  $p_1 = 4$ ,  $p_2 = 3$ , and the person wants to obtain the same utility as (18, 18). The the person needs and income of at least  **$I =$  \_\_\_\_\_**. *10 points*

