Microeconomics I - Test #2, March 20, 2009

Var. A

1. [2.5 points]

Demand for X is given by function: $X = 20 - P_X^2 + 5P_Y + 0.5I$, where X is demand for good X, P_X is its price, P_Y is price of good Y and I is income.

- Is X normal good (price goes up, demand goes down) or Giffen (price goes up, demand goes up). Explain!
- Is X ordinary good (income goes up, demand goes up) or inferior (income goes up, demand goes down). Explain!

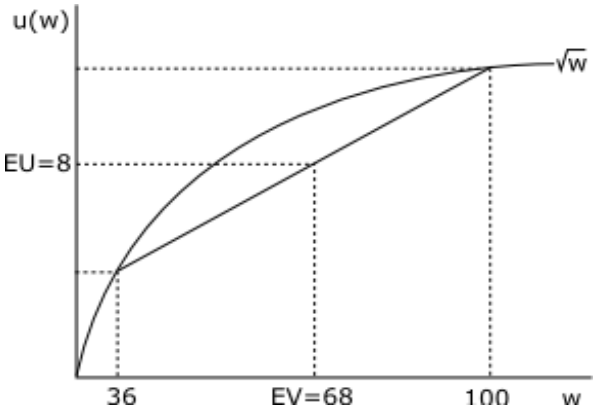
Solution:

- X is normal good because if price P_X goes up, demand X goes down (because of a negative sign in front of P_X.)
- X is ordinary good because if income I goes up, demand X goes up (because of a positive sign in front of I.)

2. [2.5 points]

Suppose that you will participate in the following lottery: With 50% probability you win 36CZK and with 50% probability you win 100CZK. Further suppose that your utility function is $U(w) = \sqrt{w}$, where w is the wealth.

- What is your expected value EV and expected utility EU?
- Depict EV and EU on the graph below.



Solution:

$$EV = 0.5 * 36 + 0.5 * 100 = 68$$
$$EU = 0.5 * \sqrt{36} + 0.5 * \sqrt{100} = 0.5 * 6 + 0.5 * 10 = 8$$

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Var. B

1. [2 points]

Demand for x is given by function: $x = 100 - 3(P_x)^2$

- Calculate the price elasticity if $P_x = 4$

Solution:

$$x = 100 - 3(P_x)^2 = x = 100 - 3(4)^2 = 100 - 48 = 52$$
$$\varepsilon_P = \frac{\Delta x/x}{\Delta P_x/P_x} = \frac{\Delta x}{\Delta P_x}\frac{P_x}{x} = -6P_x\frac{P_x}{x} = -\frac{6*4^2}{52} = -\frac{24}{13}$$

2. [3 points]

Sally's utility function is $U(w) = 3w$, where w is her wealth. She has an option to participate in two lotteries:

Lottery 1: With probability 40% Sally wins 40CZK and with probability 60% she wins 60CZK.

Lottery 2: With probability 20% Sally wins 20CZK and with probability 80% she wins 80CZK.

- Is Sally risk averse, risk neutral, or risk loving? Why?
- Compute expected values and expected utilities of both lotteries.
- Which lottery would Sally choose? Why?

Solution:

Sally is risk neutral because her utility function is linear function (straight line).

$$EV_1 = 0.4 * 40 + 0.6 * 60 = 16 + 36 = 52$$
$$EV_2 = 0.2 * 20 + 0.8 * 80 = 4 + 64 = 68$$
$$EU_1 = 0.4 * 3 * 40 + 0.6 * 3 * 60 = 48 + 108 = 156$$
$$EU_2 = 0.2 * 3 * 20 + 0.8 * 3 * 80 = 12 + 192 = 204$$

Sally would choose the second lottery because it has a higher **expected utility**.

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Var. C

1. [2.5 points]

Demand for X is given by function: $X = 20 - P_X^2 + 5P_Y + 0.5I$, where X is demand for good X, P_X is its price, P_Y is price of good Y and I is income. Further: $P_X = 5$, $P_Y = 10$, and $I = 30$.

- Compute price elasticity.
- Compute income elasticity.

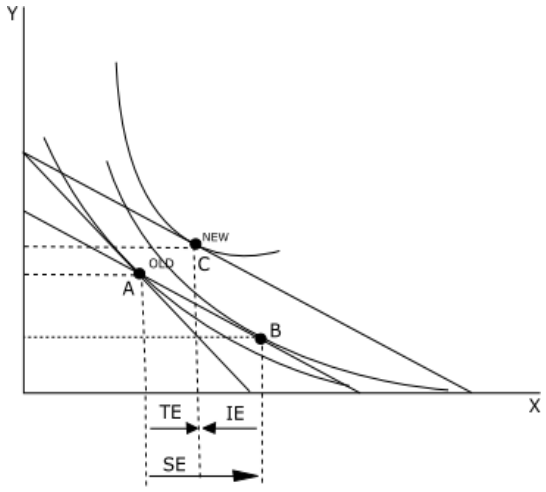
Solution:

$$X = 20 - P_X^2 + 5P_Y + 0.5I = 20 - 25 + 50 + 15 = 60$$
$$\varepsilon_P = \frac{\Delta X/X}{\Delta P_X/P_X} = \frac{\Delta X}{\Delta P_X}\frac{P_X}{X} = -2P_X\frac{P_X}{X} = -\frac{2*5^2}{60} = -\frac{50}{60} = -\frac{5}{6}$$
$$\varepsilon_I = \frac{\Delta X/X}{\Delta I/I} = \frac{\Delta X}{\Delta I}\frac{I}{X} = 0.5\frac{I}{X} = 0.5\frac{30}{60} = \frac{1}{4}$$

2. [2.5 points]

The graph below illustrates a price change of good X. In particular, point "OLD" denotes consumer's consumption before the price change and point "NEW" denotes new consumption after the **decrease in price of** X.

- Is X normal good (price goes up, demand goes down) or Giffen (price goes up, demand goes up). Explain!
- Is X ordinary good (income goes up, demand goes up) or inferior (income goes up, demand goes down). Explain!



Solution:

X is normal good because if price goes down, demand goes up (this is measured by total effect (TE), i.e. moving from point A to point C). X is inferior good because if income goes up, demand goes down (this is measured by income effect (IE), i.e. moving from point B to point C).

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Var. D

1. [2 points]
Demand for x is given by function: $x = 5 - (P_x)^3$

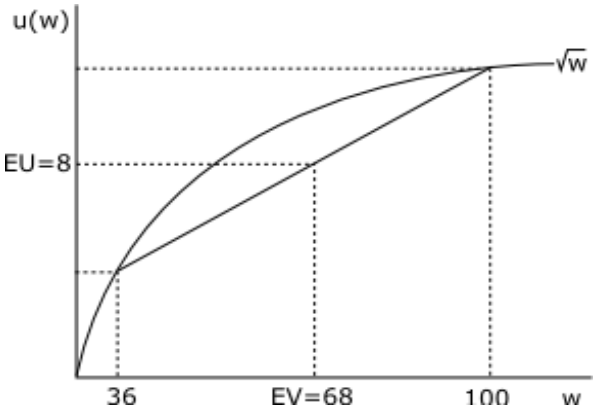
- Calculate the price elasticity if $P_x = 1$

Solution:

$$x = 5 - (P_x)^3 = 5 - 1^3 = 4$$
$$\varepsilon_P = \frac{\Delta x/x}{\Delta P_x/P_x} = \frac{\Delta x}{\Delta P_x}\frac{P_x}{x} = -3P_x^2\frac{P_x}{x} = -\frac{3 * P_x^3}{x} = -\frac{3}{4}$$

2. [3 points] Suppose that John will participate in the following lottery: With 50% probability he wins 36CZK and with 50% probability he wins 100CZK. Further suppose that his utility function is $U(w) = \sqrt{w}$, where w is the wealth.

- What is John's expected value EV and expected utility EU?
- Depict EV and EU on the graph below.
- If John can choose between this lottery and 64CZK sure wealth, what would he choose?



Solution:

$$EV = 0.5 * 36 + 0.5 * 100 = 18 + 50 = 68$$
$$EU = 0.5\sqrt{36} + 0.5\sqrt{100} = 0.5 * 6 + 0.5 * 10 = 3 + 5 = 8$$

If John chooses a lottery, his expected utility is $EU = 8$. If he chooses 64 for sure, his expected utility is $EU = \sqrt{64} = 8$. He compares these two expected utilities. They are the same, so John is indifferent between the lottery and 64 for sure.