Question 1.

Donald enjoys commodities *x* and *y* according to the utility function

$$U(x, y) = x^2 + y^2.$$

The prices of the commodities are $p_x = 3$ € and $p_y = 4$ €. Donald has *m* = 50 € to spend.

a) Write down Donald's budget constraint. What is the slope of the budget line? *(1p)*

b) What does the marginal rate of substitution (MRS) measure? Calculate the marginal rate of substitution for Donald. *(1p)*

c) Which affordable consumption bundle (*x**, *y**) maximizes Donald's utility? *(2p)*

d) Draw some of Donald's indifference curves and his budget constraint. Mark also the optimal consumption bundle. Did you find the true maximum? *(1p)*

e) How would you describe Donald's preferences? *(1p)*

Question 2.

Ms. Fogg is planning an around-the-world trip on which she plans to spend 10000 €. The utility from the trip is a function of how much she actually spends on it (*Y*), given by

$$U(Y) = \ln Y.$$

a) If there is a 25 percent probability that Ms. Fogg will lose 1000 € of her cash on the trip, what is the trip's expected utility? *(1p)*

b) Suppose that Ms. Fogg can buy full insurance against losing the 1000 € (say, by purchasing traveler's checks) at an actuarially fair premium of 250 €. What is her expected utility if she purchases this insurance? *(2p)*

c) Does Ms. Fogg buy the insurance or face the chance of losing the 1000 € without insurance? Is she risk loving, risk averse, or risk neutral? Why? *(2p)*

d) What is the maximum amount that Ms. Fogg would be willing to pay to insure her 1000 €? *(1p)*

Question 3.

a) What does it mean if two goods are perfect complements? What if they are perfect substitutes? Give examples for both. *(2p)*

b) Explain what does consumer surplus mean? How is it used and why? Illustrate your answer with a graph. *(2p)*

c) What is meant by returns-to-scale in production? Give an example using an arbitrary production function of your choice. *(2p)*

Question 4.

Suppose the demand curve *D(p)* and the supply curve *S(p)* for the market are given by the following equations:

$D(p) = 300 - p$
$S(p) = 1/2p - 30$

a) What is the equilibrium price and quantity in this market? Calculate consumer and producer surplus. *(2p)*

b) Suppose that government imposes a quantity tax $t = 15$ on firms. Solve the new market equilibrium. *(2p)*

c) Calculate the effect of the tax on the consumer and producer surplus. *(1p)*

d) Calculate the social welfare deadweight loss due to the tax policy. *(1p)*

Question 5.

In a small town there are two bakeries, A and B, baking identical breads. Denoting the amount of bread with b the cost function for both bakeries is $c(b) = 4b$. The inverse market demand curve for bread is $p(b) = 100 - 2b$. The output of bakery A is denoted with b_A and the output of bakery B with b_B.

First, assume that the two bakeries play a Cournot game (quantity competition).

a) Calculate the reaction functions for both firms: $R_A(b_B)$ and $R_B(b_A)$. Draw a graph illustrating these functions, where output b_A is on the horizontal axis and output b_B is on the vertical axis. Solve the Cournot-Nash equilibrium (b_A^*, b_B^*), and plot it on your graph. How much will bakery A produce? How much will bakery B produce? *(3p)*

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Now, suppose the producers follow a Stackelberg market model. Bakery A begins early, and acts as a Stackelberg leader. Bakery B is a Stackelberg follower.

b) Write down bakery A’s profit maximization problem. *(2p)*
   Solve the leader's Stackelberg output b_A^S.
   Solve the follower's Stackelberg output b_B^S.

Finally, suppose the producers operate as in a Bertrand game (price competition).

c) What is the Nash equilibrium price p^* in this framework? *(1p)*
   Explain the adjustment process of price setting.