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WIRTSCHAFTS- UND
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Chair of Econometrics, Statistics and Empirical Economics

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Preparatory Course for Mathematical Methods in Economics and Business

3. Exercise Sheet

Exercise 1 (Propositional Logic: Implication)

Look at the following implications and decide in each case: (i) whether the implication is true and (ii) whether the reverse implication is true. (x and y are real numbers.)

(a) $x = 5$ and $y = -3 \Rightarrow x + y = 2$

(b) $x^2 = 16 \Rightarrow x = 4$

(c) $(x-3)^2(y+2) > 0 \Rightarrow y > -2$

(d) $x^3 = 8 \Rightarrow x = 2$

Exercise 2 (Propositional Logic: Negation)

Phrase for the following propositions the negation as easy as possible:

(a) $x \geq 0$ and $y \geq 0$

(b) All x fulfill $x \geq a$

(c) Neither x nor y is smaller than 5

(d) Everyone loves cats.

(e) Everyone loves someone for some time.

Exercise 3 (Propositional Logic / Logarithmic Laws)

Check whether the following propositions are true:

(a) For arbitrary a > 1 and b > 1 it holds: $\log_a x = 0 \Rightarrow \log_b x = 0$

(b) For arbitrary a > 1 and b > 1 it holds: $\log_a x = 1 \Rightarrow \log_b x = 1$

Exercise 4 (Graph of a Function)

Sketch the graph of the following functions and determine the range of values:

(a) $f(x) = 2x - 4$ $D_f =]2; 4]$

(b) $f(x) = \ln(x + 1)$ $D_f = [-0,4; 0,4]$

(c) $y = max\{1; e^x\}$ $D_f = \mathbb{R}$

Exercise 5 (Linear Functions)

Determine the equilibrium price P for each of the two linear supply (S) and demand (D) models:

(a) $D = 75 - 3P$, $S = 20 + 2P$

(b) $D = 100 - 0.5P$, $S = 10 + 0.5P$

Exercise 6 (Linear Functions)

Determine...

(a) the relationship between the temperature scales in degree Celsius (C) and degree Fahrenheit (F), provided that (i) the relation is linear, (ii) water freezes at 0°C and 32°F and (iii) water boils at 100°C and 212°F.

(b) the temperature, that is measured by the same number in the degree Celsius and the degree Fahrenheit scale.