AAU - Business Mathematics I

Problem set #1, Due March 4, 2010

**1.** Do the following equalities hold? Graphically justify your answer.

(a) $A \cap (A \cup B) = A$

(b) $\left(A \cap B^C\right) \cap B = A \cap B$

(c) $(A \cap B) \cup (A \cap C) = A \cap (B \cup C)$

(d) $(A \cup B)^C = \left(A^C\right) \cap \left(B^C\right)$

**2.** Find negations of following expressions:

(a) Every car is red.

(b) There are two banks with low charges in the CR.

(c) More than five students do not have homework.

(d) There are no firms producing Sony computers in the Czech Republic.

(e) It snowed at least four times this January.

(f) The equation at least one solution.

**3.** Travel agency sold 100 vacation packages during one day. Flight vacations were sold two times more often than vacations to Croatia. There were 5 less flight vacations to Croatia than non-flight vacations to Croatia. Vacations that were not to Croatia nor flight vacations were sold 10 less than vacations to Croatia that are not flight vacations. How many vacations to Croatia were sold? How many flight vacations were to other destinations than Croatia? It is enough to draw Venn diagram with corresponding system of equations solving of which would lead to the result. For finding actual numbers of vacations you can get extra points.

**4.** Find intersection and union of the following sets:

(a) $A = [-5, -2]$, $B = (3, \infty)$

(b) $A = (-\infty, 14)$, $B = (-1, 5)$, $C = [3, 25]$

(c) $A = (-\infty, -2]$, $B = [-2, 3/2)$, $C = [0, 10)$

**5.** Simplify (factorize) the following algebraic expressions:

(a) $\dfrac{7x-1}{2x^2+4x}+\dfrac{5-3x}{x^2-4}$

(b) $2a^3 - a^2 - 8a + 4$

(c) $\dfrac{x}{1-x}-\dfrac{1}{x}$

(d) $\dfrac{a-3}{1-a}(a^2-2a+1)$

(e) $\dfrac{3x-1}{2x+2}-\dfrac{2x+2}{2x+1}$

(f) $\dfrac{\sqrt{x^2-8x+16}}{x^2-16}-\dfrac{x}{x+4}$

(g) $\dfrac{3xy^3z^{-2}}{5x^{-3}y^{-2}z}$

(h) $\dfrac{(a^{3/2}b^{1/2})^2}{(ab)^{1/4}}$

**6.** The demand for oranges is $q = 100 - p$ and the supply is $q = 3p + 20$, where $p$ is the price measured in dollars per hundred pounds and $q$ is the quantity measured in hundred pound units.

(a) On one graph, draw the demand curve and the supply curve for oranges.

(b) What is the equilibrium price of oranges? What is the equilibrium quantity? Show the equilibrium price and quantity on the graph and label them $p_1$ and $q_1$.

(c) A terrible drought strikes California, traditional homeland of oranges. The supply schedule shifts to $q = 3p$. The demand schedule remains as before. Draw the new supply schedule.

(d) What is the new equilibrium price of oranges? What is the new equilibrium quantity? Show the equilibrium price and quantity on the graph and label them $p_2$ and $q_2$.