Year 5. Problem Set 128 (2009-2010 school year).

1. Find limit of

   a. $\lim_{n \to \infty} \frac{2n-4}{n+1}$

   b. $\lim_{n \to \infty} \frac{3n^2+1}{2n^2+n+1}$

   c. $\lim_{n \to \infty} \frac{n^2-n+1}{2+n-2n^2}$

2. Prove that

   a. $\lim_{n \to \infty} (\sqrt{n+1} - \sqrt{n}) = 0$

   b. $\lim_{n \to \infty} (\sqrt{n^2+n} - \sqrt{n^2-n}) = 1$

3. ABC is a right triangle with the angle $B = 90^o$. The square $ACDE$ is constructed on the hypotenuse, and it is located opposite to the point B with respect to the line AC. M is the center of this square. Find the angle MBC.

4. You have 12 coins and the balance scale without weights. One of these coins is fake, but you do not know if this coin is heaver or lighter that the real ones. Find this coin in three tries.

5. Could you find such a 30-digit number that any number constructed from its 5 consecutive digits was divisible by 5?

6. 120 numbers are located in circle. The numbers are positive, but not necessary integer. Some of any 30 consecutive numbers equals 200. Prove that each number is not greater than 30.