

Department of Mathematics and Statistics  
Mathematics Introduced (“Matematiikka tutuksi”)

March 4, 2008

*Duration of the test: two hours.*

*Write your name and your social security or student number in each paper that you leave.*

*Weight of the problems: Problems 1 and 2, both 25%; Problems 3-7, 10% each.*

*With problems 1 and 2, the mere answer is not enough, show also the calculations!*

1. Solve the system of equations 
$$\begin{cases} 3y^2 - 7x^2 + 10 = 0 \\ 2y^2 - 5x^2 + 8 = 0 \end{cases}.$$
2. Solve the inequality  $|3x + 1| > |-2x| - 2.$

*With problems 3-7, you don't need to show the calculations. Four suggested answers are given in connection with each problem. If one of them is correct, write its letter (a,b,c or d) under the number of the problem in the table below; otherwise, write there an “x”.*

3. The number  $\frac{\sqrt[3]{4} - \sqrt[5]{27}}{\sqrt{6}}$  can be written as  
(a)  $2^{\frac{1}{6}} - 3^{\frac{1}{10}}$  (b)  $\frac{\sqrt[6]{2}}{\sqrt{3}} - \frac{\sqrt[10]{3}}{\sqrt{2}}$  (c)  $(\frac{2}{3})^{\frac{1}{3}} - (\frac{3}{2})^{\frac{3}{5}}$  (d)  $\frac{\sqrt[3]{2}}{\sqrt{3}} - \frac{\sqrt[10]{3}}{\sqrt{2}}$
4. The line passing through the points  $(-1, 3)$  and  $(4, 5)$  has equation  
(a)  $y = \frac{2}{5}x - 17$  (b)  $5y - 2x + 17 = 0$  (c)  $5y - 2x = 17$  (d)  $5y + 2x = 17$
5. When the numbers  $a, 4, 12, x$  ja  $b, 15, u, 8$  are inversely proportional, the value of  $x$  is  
(a)  $3\frac{1}{5}$  (b) 4 (c) 5 (d)  $7\frac{1}{2}$
6. The probability, that the absolute value of the difference of the numbers obtained at a throw of two (symmetric) dice is at most 2, is  
(a)  $\frac{1}{2}$  (b)  $\frac{2}{3}$  (c)  $\frac{3}{4}$  (d)  $\frac{4}{5}$
7. The region bounded by the graph of the function  $f(x) = 20 + 5x - 3x^2 - 2x^3$ , the  $x$ -axis and the lines  $x = 0$  and  $x = 2$ , has area  
(a)  $18\frac{1}{2}$  (b) 20 (c) 28 (d) 34

3	4	5	6	7

Department of Mathematics and Statistics  
 Mathematics Introduced (“Matematiikka tutuksi”)  
 May 13, 2008

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*Weight of the problems: Problems 1 and 2, both 25%; Problems 3-7, 10% each.*

*With problems 1 and 2, the mere answer is not enough, show also the calculations!*

1. Solve the system of equations  $\begin{cases} 2x + y - 2 = x + 3y \\ 3x + y - 3 = x + 2y + 2 \end{cases}$ .

2. Solve the inequality  $2|x| > |x - 1| + 1$ .

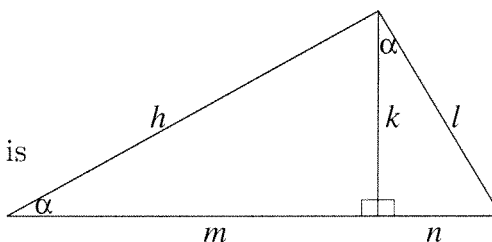
*With problems 3-7, you don't need to show the calculations. Four suggested answers are given in connection with each problem. If one of them is correct, write its letter (a,b,c or d) under the number of the problem in the table below; otherwise, write there an “x”.*

3. When you divide the polynomial  $1 - x + 2x^2 - 3x^3$  by the polynomial  $4 + 3x$ , you are left with remainder

- (a)  $-11$  (b)  $-9$  (c)  $9$  (d)  $11$

4. The lengths  $h, k, m$  and  $l, n, k$ , marked in the figure on the right, are directly proportional and the coefficient of proportionality is

- (a)  $\sin \alpha$  (b)  $\cos \alpha$  (c)  $\tan \alpha$  (d)  $\cot \alpha$



5. The value of the sum  $\frac{2}{3} + \frac{4}{3} + \frac{8}{3} + \dots + \frac{2^{30}}{3}$  is

- (a)  $\frac{1}{3} + \frac{2^{30}}{3}$  (b)  $\frac{2^{31}-2}{3}$  (c)  $\frac{2^{31}-1}{3}$  (d)  $\frac{2^{30}-1}{3}$

6. The value of the binomial coefficient  $\binom{12}{7}$  is

- (a) 622 (b) 684 (c) 792 (d) 1036

7. The region bounded by the graph of the function  $f(x) = 15 + x^3 + 5x^4$ , the  $x$ -axis and the lines  $x = -1$  and  $x = 1$ , has area

- (a)  $16\frac{1}{2}$  (b) 18 (c) 32 (d)  $34\frac{1}{4}$

3	4	5	6	7