Name: _____

1.	2.	3.	4.	5.	6.	7.	8.	$\sum$
6/	6/	6/	7/	7/	6/	6/	6/	50___

Mathematics II. (BSc)– Exam 1.
May 28, 2014.

You need reach at least 20 points to pass.

1. (6 p.) Give the coordinates of the vector $\underline{v} = (0, 2, 3)$ with respect to the basis formed by

   the vectors

   $$\underline{a}_1 = (4, 0, 1)\,, \quad \underline{a}_2 = (-2, 1, 0)\,, \quad \underline{a}_3 = (-2, 0, 1)\,.$$

2. (6 p.) Let

   $$\underline{\underline{A}} = \begin{pmatrix} 4 & -2 & -2 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}.$$

   Find the eigenvalues and eigenvectors of the matrix $\underline{\underline{A}}$.

3. (6 p.) Solve the next differential equation using Laplace transform:

   $$y'' + 4y = \cos x, \qquad y(0) = 0, \qquad y'(0) = 1.$$

4. (7 p.) Solve the following differential equation:

   $$y'' - 2y' + 2y = 5\sin x, \qquad y(0) = 1, \qquad y'(0) = 0.$$

5. (7 p.) a.) Find the values of the double integral:

$$\iint_{T:\ 1\le x^2+y^2\le 4,\ \ 0\le x,y,\ x\le y\le\sqrt{3}x} 2yx^2 dxdy.$$

b.) Sketch the region of integration, reverse the order of integration, and evaluate

the integral:

$$\int_{y=0}^{2}\int_{x=0}^{y} 5xydxdy + \int_{y=2}^{4}\int_{x=0}^{4-y} 5xydxdy.$$

6. (6 p.) Let the function

$$f(x,y) = \frac{\sin(x-y)}{x^2-y^2}$$

is an equation of a surface.

a.) Find the gradient of the function at $P_0\,(0,\pi)$?

b.) Give the equation of the tangent plane at $P_0\,(0,\pi)$.

c.) Calculate the directional derivative of $f(x,y)$ at $P_0\,(0,\pi)$

in the direction $\underline{v} = (-8,6)$.

7. (6 p.) Find the domain of convergence and the sum of the series:

$$\sum_{n=1}^{\infty} \frac{x^{n-1}}{n}.$$

8. (6 p.) Find Taylor series at $x_o = 0$ for the functions

a.) $f(x) = \dfrac{1}{1+3x}$, b.) $g(x) = \dfrac{1}{(1+3x)^2}$.

and give the domain of convergence.