

Name:

1.	2.	3.	4.	5.	6.	7.	8.	Σ
6/	6/	6/	7/	6/	6/	6/	7/	50__

Mathematics II. (BSc)– Extra1 Test
14th of May, 2014.
90 minutes
(You need reach at least 15 points to pass.)

1. (6 p.)

$$\underline{A} = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & -1 \end{pmatrix}$$

a.) $\det \underline{A} = ?$, b.) $\det \underline{A}^3 = ?$, c.) $\det(3\underline{A}^{-1}) = ?$

2. (6 p.) Solve this parametrical linear equation system. At which values of p will the system have infinitely many solutions? Give the solution sets in these cases.

$$\begin{aligned} x + y - z &= 2 \\ 2x + 3y - 5z &= 5 \\ x + (p+1)y + (1-2p)z &= 2p+4 \\ -x - y + (p^2-3)z &= 2p+2 \end{aligned}$$

3. (6 p.) Find the eigenvalues and eigenvectors of the matrix \underline{C} .

$$\underline{C} = \begin{pmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & -1 \end{pmatrix}$$

4. (7 p.)

a.) $\mathcal{L}(t \cosh 3t) = ?$, b.) $\mathcal{L}^{-1}\left(\frac{3s}{s^2 - 2s + 3}\right) = ?$,

c.) Solve the next differential equation using Laplace transform:

$$y'' - 6y' + 10y = 6e^{2x}, \quad y(0) = y'(0) = 1.$$

5. (6 p.) Find the value of the integral if it exist:

$$\int_{-1}^{\infty} \frac{1}{x^2 + 4x + 5} dx.$$

6. (5 p.) Is the following series convergent or divergent?

$$\sum_{n=1}^{\infty} \left(\frac{6n+3}{7n+4} \right)^{n^2-n}$$

7. (6 p.) Given the function

$$f(x,y) = \frac{(y+1)\cos(2x)}{y-2}$$

and a point $P_o(\frac{\pi}{2}, 1)$.

- Find the derivative of f at P_o in the direction of $\underline{v} = -3\underline{i} + 4\underline{j}$.
 - Find the direction in which f increases or decreases most rapidly at P_o . Then find the derivatives of f in these directions.
 - Find an equation for the tangent plane at the point P_o on the given surface.
8. (7 p.) Solve the following differential equation:

$$y'' + y' - 2y = 3e^{-2x}.$$