

Sample Test 2
Mathematics A2
April, 2011

1. (4 points) Give the rank of the matrix

$$\mathbf{A} = \begin{bmatrix} 3 & 2 & 1 \\ 4 & -1 & 1 \\ 7 & 1 & 2 \end{bmatrix}.$$

2. (4 points) Given the matrix, find

a.) eigen-values, eigen-vectors,

b.) \mathbf{A}^{10} .

$$\mathbf{A} = \begin{bmatrix} 3 & 3 \\ 4 & 2 \end{bmatrix}$$

3. (8 points) Find the directional derivative of the function

$$f(x, y) = 9 - x^2 - y^2$$

at the point $P(1;2)$ in the direction of the vector $\mathbf{v} = (-3;4)$.

4. (4 points) Find all local extrema (location and type of extrema) for the function

$$f(x, y) = xye^{-x-y}.$$