Fayoum university	Mechanical	Differentiation and
Faculty of Engineering	Engineering	Integration III And linear
First year	term Exam	algebra
Time: 3 hour		2 -1-2016

Maximum Points=60

1-for the following matrix calculate (18 points)

$$A=\begin{pmatrix} -1 & 0 & 5 \\ 1 & 5 & 3 \\ -3 & 0 & 7 \end{pmatrix}$$

A-eigenvalue and the eigenvectors (9 points)

B- e^A (9 points)

2-find the value of a and b that make the following vectors are orthogonal $\{v_1, v_2, v_3\}$ $v_1=\begin{pmatrix} a^2 \\ 1 \\ 0 \\ -1 \end{pmatrix}, v_2=\begin{pmatrix} -5 \\ 1 \\ 3 \\ -4 \end{pmatrix}, v_3=\begin{pmatrix} 0 \\ 1 \\ b \\ 1 \end{pmatrix}$ (5 points)

3- Prove that the following line integral is independent of path and evaluate it

$$\int_{(0,0)}^{(\frac{\pi}{2},1)} (2xy^3 - y^2\cos x)dx + (1-2y\sin x + 3x^2y^2)dy$$ (5 points)

4-Find the volume of the region bounded by the surfaces $y=x^2$, $y^2=x$ and the planes z=0, z=3. (8 points)

5-Evaluate the following integrals (8 points)

a- $\int_0^4 \int_{\sqrt{y}}^2 \frac{e^x}{x^2} dx dy$

b- $\int_0^1 \int_0^{\sqrt{1-x^2}} (1-x^2-y^2)^{3/2} dy dx$

6- Find the extreme subject to the constrain

f(x,y)=xy, $\frac{x^2}{8}+\frac{y^2}{2}=1$ (6 points)

7-Find the mass of the region enclosed by the two circles $x^2+y^2=25$ And $x^2+y^2=9$ if its surface density $f(x,y)= \sin(x^2+y^2)$

(10 points)

With my best wishes