Department of Energy and Sustainable Energy	Mathematics 3	Mid-Term Exam-1
Answer **All** questions Duration: 1 Hour	November, 2016	30 Marks

[1] Find the first and second derivatives of the function : $f(x,y) = y^3 + y + x.e^x$

[2] Find the first derivatives of each function :

(a) $f(x,y,z) = x\cosh y + z.\ln y + z^4$ (b) $f(x,y,z) = 2x^3 + yz + \sin z$

[3]Find the envelope of the curves : $x\cos\alpha + y\sin\alpha = 4$

[4]Verify Euler's theorem for the function : $f(x,y) = x^4 + 3x\,y^3 - y^4$.

[5]Determine the extrema of the function : $f(x,y) = \mathrm{x}^2 + 2\mathrm{y}^2 + 6\mathrm{x} - 8\mathrm{y} + 1$

[6] Find $\nabla\varphi$ where : $\varphi = x^4y + z\sin y - 2^z$

[7] Find $\nabla.\overline{\mathrm{U}}$ where : $\bar{U} = (x^2 + y)i + (y - z)j + (x\cos z)k.$

[8] Find the integral : $\int_{(1,1)}^{2,4)}(xy)dx + (2x - y)dy$ through the curve $y = x^2$.

Good Luck *Dr. Mohamed Eid*