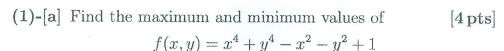
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Mansoura University Faculty of Engineering	BCE Level100 First Term Exam	and the second
Math. & Engineering Physics Dept. Instructor: Prof. Dr. Mohamed El-Gamel	Math. (106) Full Mark: 50	Time ² 2 hours Final Exam: 25-12- 2017



[b] Let

$$f(x, y, z) = e^{x^2 y^3 z^4}$$
 [4 pts]
and $F = (x^2 z - yz) i + z e^{2y} j + y e^{z-x} k$

Decide which of the following operations are defined and evaluate those that are defined

$$\nabla f, \quad \nabla \cdot f, \quad \nabla F, \quad \nabla \cdot (\nabla \times \nabla f)$$
[c] Find
$$\frac{d}{d\alpha} \int_{-2\alpha^2}^{-\alpha} e^{\alpha x^3} dx$$
 [4 pts]

[d] Evaluate the following integrals [12 pts]

$$\int_{0}^{1} \int_{\sqrt{y}}^{1} \cos x^{3} dx dy \qquad \int_{-2}^{2} \int_{-\sqrt{4-y^{2}}}^{\sqrt{4-y^{2}}} e^{x^{2}+y^{2}} dx dy$$
$$\int_{1}^{2} \int_{x}^{x^{2}} \int_{0}^{\ln x} x e^{y} dy dz dx$$

(2)-[a] Solve by any method 1. $y''' - 6y'' + 12y' - 8y = 17e^{2x}$

 $[20\,\mathrm{pts}]$

2.
$$y + \frac{xy'}{2} - \frac{2\sqrt{y}}{x} = x^4\sqrt{y}e^{-x\sqrt{y}}$$

$$3. \quad \sin^{-1}\left(\frac{dy}{dx}\right) = x + y$$

4.
$$x^2y'' - 2xy' + 2y = \cos\left(\frac{1}{x}\right)$$

(b) Determine whether the functions y_1 and y_2 are linearly dependent or independent [4 pts]

$$y_1 = \ln x \qquad \qquad y_2 = \ln x^n$$

(c) Find a second linearly independent solution. What is the general solution of the differential equation? [4 pts]

$$y'' - y = 0 y_1(x) = e^x$$