Mansoura University	Final Term Exam	Wednesday, 31/8/2016
Faculty of Engineering	Mathematics (2)	Time allowed: **2** hours
Level 000 Students	MTH003	Full Mark: **50** marks

Answer the following questions:

Question (1) [15 marks]

a) [7 marks] For the equation $x^2 - 2x - 4y + 9 = 0$. Find vertex, focus, axis, directrix, length of LR and ends of LR.

b) [4 marks] Find the equation of the plane containing z-axis and perpendicular to the plane $x - 2y + z + 1 = 0$.

c) [4 marks] Find the equations of the line of intersection of the two planes:

$$x + y - 2z = 2 \quad \text{and} \quad 2x - y - z = 1$$

Question (2) [10 marks]

a) [4 marks] For the sphere $x^2 + y^2 + z^2 - 2z + c = 0$. If the plane $x + 2y + 2z + 4 = 0$ touches this sphere, find the value of the constant c.

b) [6 marks] Given the surface equation $x^2 + 2z^2 = (y - 1)^2$

i. State the surface name, its vertex and its main axis.

ii. Describe the traces in the xy-plane, the plane $z = 1$ and the plane $y = 1$.

Go to the next page

Question (3) [9 marks]

[3 marks each] Evaluate the following integrals (if it exists):

a) $\int \frac{x^2}{(1-x^2)^{3/2}}\,dx$ b) $\int_{-1}^{1} \frac{1+\tan^5 x}{1+x^2}\,dx$ c) $\int_0^{\infty} \frac{1}{x^2}\,dx$

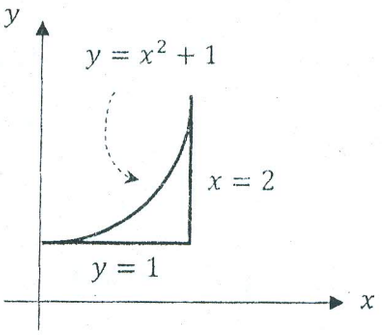
Question (4) [16 marks]

a) [4 marks] Find the area of the region bounded by $y = \sin x$ and the x-axis on the interval $[0, \frac{3\pi}{2}]$.

b) [6 marks] Find the volume of the solid generated by revolving the bounded region shown in the figure:

i. about the line $y = 1$.

ii. about the y-axis.



c) [6 marks]

i. Find the length of the arc

$$x = 2 + 3t, \quad y = \cosh 3t, \quad 0 \le t \le 1.$$

ii. Find the area of the surface generated by rotating this arc about the line $x = 2$.

Best Regards, Dr. Mustafa El-Agamy