Benha University Faculty of Engineering – Shoubra Department of Industrial Engineering Course: Mathematics 2 Code: EMP 102		Final Exam Date : January 21, 2017 Answer **All** questions Duration: 2 hours
• The exam consists of one page		• No. of questions: 4 Total Mark: 40

Question 1 6

Find **y`** from the following:

(a) $y = 4^x + 3\sinh x$ (b) $y = (x^3 + \cosh x)^5$ (c) $y = \sin^{-1} x + \sinh^{-1} x$

(d) $y = \ln x + \log x$ (e) $y = 8 + x.\tanh x$ (f) $y = e^y + x.\cosh x$

Question 2 12

Find the integrals:

(a) $\int (x^3 - 4^x + 4)\,dx$ (b) $\int (\sinh 2x - \cosh x)\,dx$ (c) $\int \frac{x+1}{x^2-6x+8}\,dx$ (d) $\int \ln x\,dx$

Question 3

(a)Find the area of the region between the curve $y = x^2 - 1$, x-axis, x in [0, 2]. 3

(b)If the region between the curve $y = x^2 + 2$, x-axis, x in [1, 2] is rotated about 6

(i) x-axis (ii)y-axis. Find the volume of the generated solids V_x, V_y.

(c)Separate the lines and find the angle between them : $x^2 - 6xy + 8y^2 = 0$. 2

Question 4

(a)State the definition of the circle. 1

(b) State the definition of the ellipse. 1

(c)Write the equation of circle where the points (1, 2), (3, –1) are ends of diameter. 3

(d)Find the vertex , focus and sketch the parabola : $y^2 + 8x - 4y - 20 = 0$. 3

(e)Find center, vertices and sketch the hyperbola : $4x^2 - 9y^2 - 8x + 36y + 4 = 0$. 3

Good Luck *Dr. Mohamed Eid*

Model Answer

Answer of Question 1

(a) $y` = 4^{x}.\ln 4 + 3\cosh x$ (b) $y` = 5(x^3 + \cosh x)^4(3x^2 + \sinh x)$

(c) $y` = \frac{1}{\sqrt{1-x^2}} + \frac{1}{\sqrt{1+x^2}}$ (d) $y` = \frac{1}{x} + \frac{1}{\ln 10}.\frac{1}{x}$

(e) $y` = 0 + 1.\tanh x + x\,\mathrm{sech}^2 x$ (f) $y` = e^{y}.y` + 1.\cosh x + x\sinh x$

----------*6- Marks*

Answer of Question 2

(a)$\int (x^3 - 4^{x} + 4)\,dx = \frac{x^4}{4} - \frac{4^{x}}{\ln 4} + 4x + c$

(b) $\int (\sinh 2x - \cosh x)\,dx = \frac{1}{2}\cosh 2x - \sinh x + c$

(c)$\int \frac{x+1}{x^2-6x+8}\,dx = \int (\frac{5/2}{x-4} - \frac{3/2}{x-2})\,dx = \frac{5}{2}\ln(x-4) - \frac{3}{2}\ln(x-2) + c$

(d)$\int \ln x\,dx = x\ln x - x + c$

----------*12- Marks*

Answer of Question 3

(a)From $x^2 - 1 = 0$, we get x = 1 inside the interval and x = – 1 outside the interval

Then $A = \int_0^1 (x^2 - 1)dx + \int_1^2 (x^2 - 1)dx = |-\frac{2}{3}| + \frac{4}{3} = 2$

----------*3- Marks*

(b)(i) $V_x = \pi \int_1^2 (x^2 + 2)^2\,dx = 19.53\pi$

(ii) $V_y = 2\pi \int_1^2 x(x^2 + 2)\quad dx = 13.5\pi$

----------*6- Marks*

(c) $x^2 — 6xy + 8y^2 = (x - 2y)(x - 4y) = 0$

The two lines are : x – 2y = 0 , x – 4y = 0 and $\tan\theta = \frac{\frac{1}{2} - \frac{1}{4}}{1 + \frac{1}{8}} = -\frac{2}{9}$

----------*2- Marks*

Answer of Question 4

(a)Circle (b)Ellipse

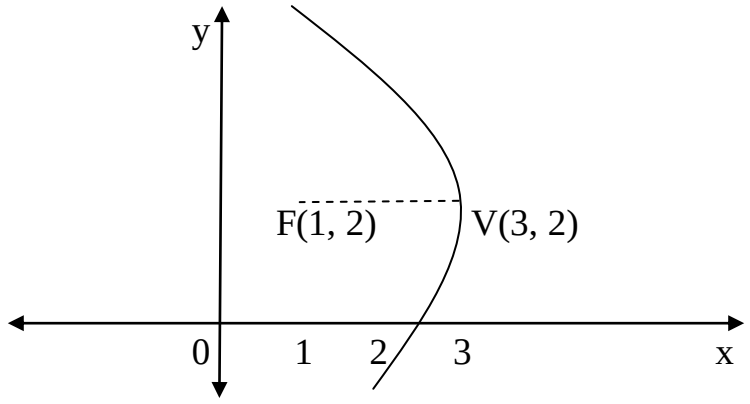
----------*2- Marks*

(c)The circle is : $(x-1)(x-3)+(y-2)(y+1)=0$ Or $x^2+y^2-4x-y+1=0$

----------*3- Marks*

(d)From : $y^2+8x-4y-20=0$, we get $(y-2)^2=-8(x-3)$

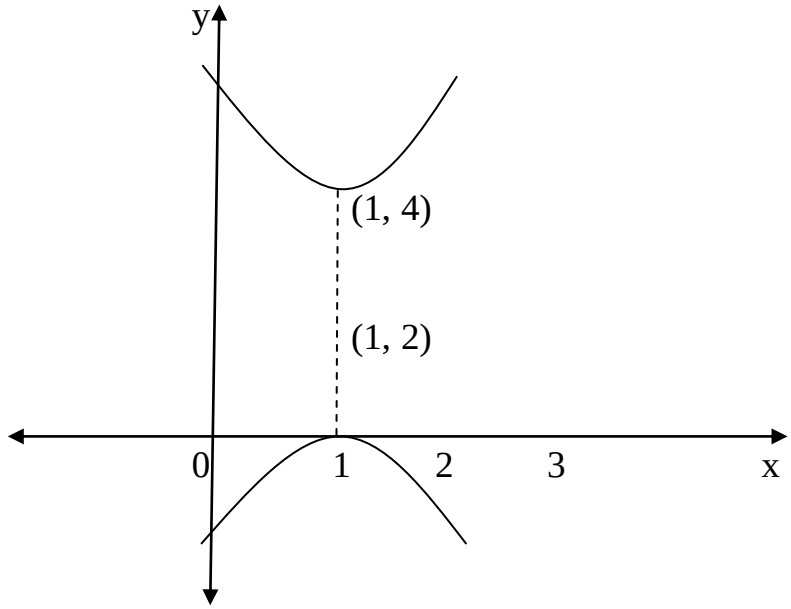
The vertex is (3, 2) , a = – 2.



----------*3- Marks*

(e)From : $4x^2-9y^2-8x+36y+4=0$, we get $\frac{(y-2)^2}{4}-\frac{(x-1)^2}{9}=1$

The center is (1, 2) , b = 2.



----------*3- Marks*

Dr. Mohamed Eid