Arab Academy for Science, Technology & Maritime Transport

College of Engineering &Technology

Final Examination Paper

Department	Basic & Applied Science	**Date**	04/01/2014
Lecturer	Course coordinator : Dr. Allam Abdelaziz	**Marks**	40
Course Title	Mathematics 1	**Time Allowed**	2 hours
Course Code	BA123	**Start Time**	09:00-11:00

Q1 : **Find** $\frac{dy}{dx}$ **for** $y = x^3 \cos x^2 - 2 \cot x^{-3}$.

2 Marks

Q2 : **Find** $\frac{dy}{dx}$ **for** $y = \left(\frac{x^x \ \cosh^{-1} x}{\left(1 - x^2\right)^3 \ \operatorname{cosec}^2 x} \right)^4$.

4 Marks

Q3 : **Find** $\frac{dy}{dx}$ **for** $\sin(xy) - y^3 = 0$.

3 Marks

Q4 : **Evaluate the following limit** $\lim_{\varphi \to 0} (\csc\varphi - \cot\varphi)$.

3 Marks

Q5 : Evaluate the following limit $\lim_{x\to\infty}\left(\frac{x}{x+1}\right)^{x}$ **.**

4 Marks

Q6 : If $x = e^t$ and $y = e^{4t}$, Show that $y'' = 12\,x^2$.

4 Marks

Q7 : Using Maclaurin's expansion, Show that

$$e^{-x}\ sin(2x) = 2\ x - 2\ x^2 - \frac{1}{3}\ x^3 + x^4 + \cdots \quad .$$

4 Marks

Q8 : **If** $z = ln\left(x^2 + y^2\right)$ **, show that** $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$ **.**

5 Marks

Q9 : Discuss and sketch the curve $x^2 + 2x - 4y - 3 = 0$ **.**

5 Marks

Q10 : For the curve $y = x^3 - 6x^2 + 10$

6 Marks

(a) Find the critical points.
(b) Find the intervals in which the curve is increasing and decreasing.
(c) Find the local maximum and minimum points.
(d) Find the inflection point.
(e) Find the concavity of the curve.
(f) Sketch the curve.

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