Arab Academy for Science, Technology & Maritime Transport

College of Engineering &Technology

Final Examination Paper

Department	Basic & Applied Science	**Date**	14/01/2012
Lecturer	Mathematics Group	**Marks**	40
Course Title	Mathematics 1	**Time Allowed**	2 hours
Course Code	BA123	**Start Time**	09:00-11:00

Members of Course Examination Committee:	Signature	Date
Dr. Nasser M. El-Maghraby		
Dr. Allam Abdel Aziz		
Dr. Mohamed Abdel Hamid		

Marks

Find $\frac{dy}{dx}$ for each of the following functions (From Q1 to Q3):

Q1. $y = \left(\frac{1+\sin^{-1} x}{1-\cos^{-1} x} \right)^3$.

3

Marks

Q2. $y = \left(\frac{e^{\operatorname{cosec}\sqrt{x}} (x)^x}{\left(\tanh^{-1} x^2\right)\left(\ln x\right)} \right)^{1/2}$.

3

Marks

Q3. $x + y^2 = e^{x/y}$

3

Marks

Q4. **If** $y = \cos(2t)$ **and** $x = \cos(t)$**, Show that** $\frac{d^2y}{dx^2} = 4$.

3

Marks

Evaluate the following limits (From Q5 to Q6):

Q5. $\lim_{x \to 0} \left(1+\sin x\right)^{1/x}$.

4

Marks

Q6. $\lim_{x \to 1} \dfrac{1-\cos\left(x^3-1\right)}{x-1}$.

2

Marks

Q7. **Find the nth derivative for** $y = \dfrac{1-x}{1+x}$.

4

Marks

Q8. Using Maclaurin's expansion, Show that

$$\frac{\cos x}{\sqrt{1+x}} = 1 - \frac{1}{2}x - \frac{1}{8}x^2 - \frac{1}{16}x^3 + \cdots \quad .$$

4

Marks

Q9. If $z = \cot^{-1}\frac{x}{y}$, show that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$.

5

Marks

Q10. For the curve $y = x^3 - 3x^2 - 9$, find

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

5

Finally, sketch the curve.

Marks

Q11. Discuss and sketch the curve $y^2 - 4y - 4x + 12 = 0$.

4