

**Arab Academy for Science, Technology  
& Maritime Transport**

**College of Engineering & Technology**

**Final Examination Paper**



<b>Department</b>	Basic & Applied Science	<b>Date</b>	05/01/2013
<b>Lecturer</b>	Mathematics Group	<b>Marks</b>	40
<b>Course Title</b>	Mathematics 1	<b>Time Allowed</b>	2 hours
<b>Course Code</b>	BA123	<b>Start Time</b>	09:00-11:00

Find  $\frac{d y}{d x}$  for each of the following functions (From Q1 to Q3):

Q1 :  $y = (1 - x^3) \sinh^{-1} \sqrt{x}$  .

**3**  
**Marks**

Q2 :  $y^3 = \left( \frac{(\sec x)^x \cosh^3 x}{e^{x^2} \tan^{-1} x} \right)^{1/5}$  .

**3**  
**Marks**

Q3 :  $y - \sin(3x + 4y^2) = 0$  .

3  
Marks

Q4 : If  $x = \sec\left(\frac{t}{1+t}\right)$  and  $y = \tan^2\left(\frac{t}{1+t}\right)$ , Show that  
 $y'' = 2$  .

3  
Marks

**Evaluate the following limits (From Q5 to Q6):**

Q5 :  $\lim_{x \rightarrow 0} (1 + 5 \tan x)^{1/x^2}$  .

4

**Marks**

Q6 :  $\lim_{x \rightarrow 2} \frac{\sin(x^2 - 4)}{x - 2}$  .

2

**Marks**

**Q7 :**      **Using Maclaurin's expansion, Show that**

$$\frac{\sin x}{1-x} = x + x^2 + \frac{5}{6}x^3 + \frac{5}{6}x^4 + \dots .$$

**5**  
**Marks**

**Q8 :**      **If**  $z = \tan^{-1}\left(\frac{x}{y}\right)$ , **show that**  $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$  .

<b>5</b> <b><u>Marks</u></b>

**Q9 :** For the following function  $y = \frac{x}{x^2 - 1}$

(a) Find the domain.

(b) Find the vertical asymptote(s).

(c) Find the horizontal asymptote(s).

(d) Discuss the symmetry of the function.

(e) Find the  $x$  - and  $y$  - intercept(s), if there exist.

<b>7</b> <b><u>Marks</u></b>

(f) Find the intervals of increase and decrease.

(g) Find the critical point(s).

(h) Find the local maximum(s) and minimum(s).



**Q10 :** Discuss and sketch the curve  $y^2 + 6y + 8x - 15 = 0$  .

<b>5</b> <b><u>Marks</u></b>