

Arab Academy for Science, Technology
& Maritime Transport



College of Engineering & Technology
Final Examination Paper

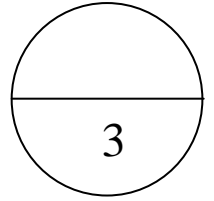
Department	Basic & Applied Science	Date	14/01/2012
Lecturer	Mathematics Group	Marks	40
Course Title	Mathematics 1	Time Allowed	2 hours
Course Code	BA123	Start Time	09:00-11:00

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

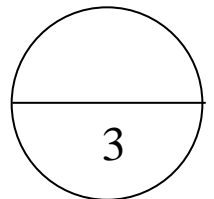
Marks

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

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

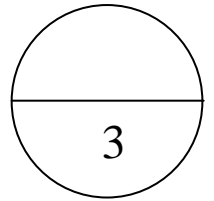
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Q2. $y = \left(\frac{e^{\operatorname{cosec} \sqrt{x}} (x)^x}{(\tanh^{-1} x^2)(\ln x)} \right)^{1/2} .$



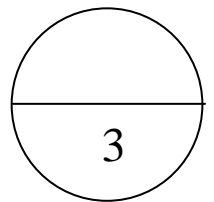
Q3. $x + y^2 = e^{x/y}$

Marks



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

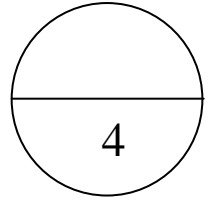
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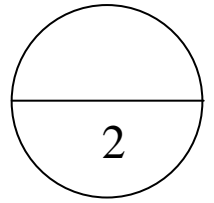
Evaluate the following limits (From Q5 to Q6):

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



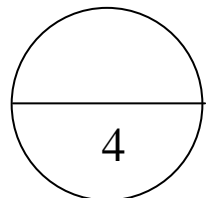
Q6. $\lim_{x \rightarrow 1} \frac{1 - \cos(x^3 - 1)}{x - 1} .$

Marks



Q7. Find the n^{th} derivative for $y = \frac{1-x}{1+x} .$

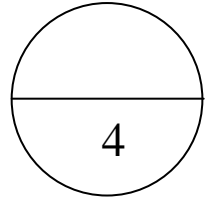
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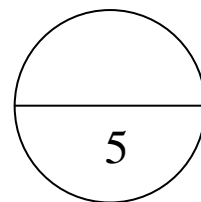
Q8. Using Maclaurin's expansion, Show that

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



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

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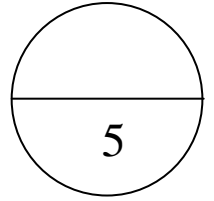


Marks

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.

Finally, sketch the curve.



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

Marks

