UNIVERSITY OF BAHRAIN
College of Science
Department of Mathematics
Second semester 2012/2013
First Exam

Math: 102

Time:4-5 P.M.

Max Marks : 25

Date: 09/04/2013

Student's Name	
I. D. Number	
Section	

Instructions

1) Please, write your name, I. D. number and section in the above box.
2) If more space is needed, use back of the previous page.
3) Please make sure your copy of this examination consists of 5 pages including the cover page and 3 questions.
4) The first question is a multiple choice question consisting of 8 parts.
5) Show all your work except for question one.

Question	Max. Marks	Marks obtained
1	8	
2	8	
3	9	
Total	25	

<u>Question1:</u> [8 marks]
Circle the correct answer:

- The derivative of $y = \tan^{-1}(\ln 5x)$ is

  a) $\dfrac{1}{x\left(1+(\ln 5x)^2\right)}$

  b) $\dfrac{5}{x\left(1+(\ln 5x)^2\right)}$

  c) $\dfrac{1}{1+(\ln 5x)^2}$

  d) $\dfrac{1}{x\sqrt{1+(\ln x)^2}}$

- $\lim\limits_{x \to 0} \dfrac{\cos 7x - 1}{x^2} =$

  a) $\dfrac{7}{2}$

  b) 0

  c) $\dfrac{49}{2}$

  d) $-\dfrac{49}{2}$

- The derivative of $y = \sinh^2 5x$ is
  a) $10\cosh 5x$
  b) $2\sinh 5x \cosh 5x$
  c) $10\sinh 5x \cosh 5x$
  d) $2\cosh 5x$

- A trigonometric substitution that solves the integral $\int \left(3 - x^2\right)^{\frac{3}{2}} dx$ is
  a) $x = 3\sin\theta$
  b) $x = \sqrt{3}\sin\theta$
  c) $x = \sqrt{3}\tan\theta$
  d) $x = 3\sec\theta$

- $\int \dfrac{-\left(\cot^{-1} x\right)^8 \, dx}{1+x^2} =$

  a) $\sqrt{\cot^{-1} x} + C$

  b) $-8\left(\cot^{-1} x\right)^9 + C$

  c) $8\left(\cot^{-1} x\right)^7 + C$

  d) $\dfrac{\left(\cot^{-1} x\right)^9}{9} + C$

- $\int \operatorname{sech}^2(5x-6) \, dx =$

  a) $\tanh(5x-6) + C$

  b) $\dfrac{1}{5}\coth(5x-6) + C$

  c) $\dfrac{1}{5}\tanh(5x-6) + C$

  d) $\dfrac{5}{6}\operatorname{sech}^2(5x-6) + C$

- $\int \sin 2x \, \cos 5x \, dx =$

  a) $\dfrac{1}{2}\left[\dfrac{\cos 3x}{3} + \dfrac{\cos 7x}{7}\right] + C$

  b) $\dfrac{1}{2}\left[\dfrac{\cos 3x}{3} - \dfrac{\cos 7x}{7}\right] + C$

  c) $\dfrac{1}{2}\left[-\dfrac{\sin 3x}{3} + \dfrac{\sin 7x}{7}\right] + C$

  d) $\dfrac{1}{2}\left[\dfrac{\sin 3x}{3} + \dfrac{\sin 7x}{7}\right] + C$

- The value of the $\int_{0}^{\pi/2} \sin^2 x \, \cos x \, dx =$

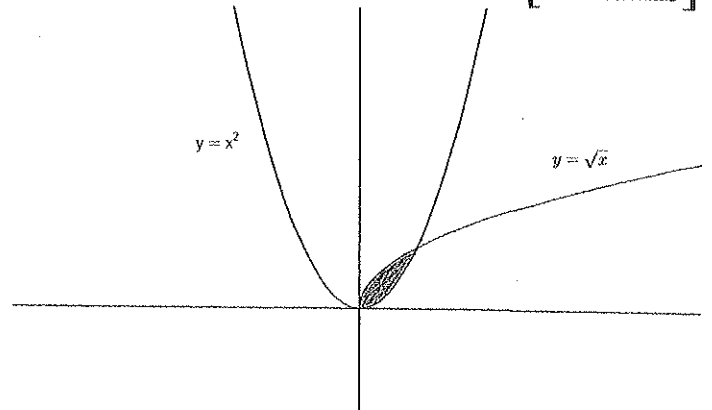 a) $\dfrac{1}{3}$

  b) 2

  c) $\dfrac{\pi}{2}$

  d) 0

3

Question2 : [8 marks]

Let R denote the region bounded by $y = x^2$ and $y = \sqrt{x}$ (see the shaded region).

a) Find the area of the region R.   [3marks]

b) Find the volume of the solid generated by revolving the region R about $x-axis$.   [3marks]

c) Set up an integral to find the volume of the solid resulting by revolving the region R about $x = 2$.   [2marks]

Question 3 : [9 marks]

a) Find the limit : $\displaystyle\lim_{x\to 0}\left(e^{x}+x\right)^{\frac{1}{x}}$

[3marks]

b) Evaluate the following integrals : [6 marks]

i) $\displaystyle\int \frac{dx}{x^{2}-4x+13}$

ii) $\displaystyle\int x\,\csc^{2}x\,\,dx$