MAT120: Integral Calculus and Differential Equations
BRAC University

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Inspiring Excellence

SET: I

Assignment 3

Please write your name and ID on the assignment script. The deadline for submitting the assignment is ***8th August 2020****. Solve* ***all the problems****. You will receive* 5 *bonus marks for* ***submitting your assignment in LaTeX****.*

Any information you need to solve this exam are given in the question.

Watch the videos in this Playlist if you are confused about the assignment process: ***All About Assignments Playlist, Click Here***

Be creative, use your intuition. Answer the questions by yourself. Cheating and Copying will lead to ***50%*** *deduction from your total marks in the course and a Zero in the assignment.* ***Total marks is 60****. Each question carries 10 marks.*

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1. You all have learnt the concept of finding arc lengths of curves that are bounded over some interval. The formula for finding the aforementioned arc length of a curve, are as follows

$$\text{Arc Length} = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx.$$

Where $f'(x)$ denotes the first derivative of $f(x)$.

Given the function

$$f(x) = 9x^{3/2}.$$

Find out what the arc length is for the function bounded by the interval [0,1].

2. Find the area of surface that is generated by revolving the portion of the curve $x = 2\sqrt{1-y}$, $-1 \leq y \leq 0$ about the y-axis.

3. Evaluate $\displaystyle\int_0^\infty \frac{(x^6 - x^3)x^2}{(1+x^3)^5}\, dx$; $\quad \left[\text{ Use } \beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}\, dx\right]$

4. Evaluate: $\displaystyle\int_0^{\frac{\pi}{2}} \sqrt{tan\theta}\, d\theta$,

5. Evaluate the following indefinite integrals by using appropriate substitutions:
$\int \sqrt{4x^2 - 8x + 24}\, dx$

6. Evaluate in terms of gamma function:

$$\int_0^\infty x^6 e^{-3x} dx$$