BRAC UNIVERSITY

Inspiring Excellence

Department of Mathematics and Natural Sciences
MAT120 : Integral Calculus and Differential Equations

Assignment-1

All Questions Contain 5 marks **Total= $20 \times 5 = 100$**

Riemann Sums

Use the Riemann sum (left, right and midpoint rule) for each sub-interval to approximate the area under the given curves $f(x)$ within the specified interval.

1. $f(x) = 4 - \frac{x^2}{4},\ [0,3]$
2. $f(x) = 2x - x^2,\ [-1,3]$
3. $f(x) = 1 - x^3,\ [-3,-1]$
4. $f(x) = 5 + x - x^2,\ [0,4]$
5. $f(x) = 2x - 3x^2 - 1,\ [-4,0]$.

Substitution Integration

Evaluate the Following Integrations.

1. (a) $\int \frac{\cos^5 2x}{\sin^3 2x}\,dx$
   (b) $\int \sec^8 4x\,dx$
2. (a) $\int \frac{x^5}{(9x^2-25)^{\frac{3}{2}}}\,dx$
   (b) $\int \frac{e^{12x}}{\sqrt{4e^{6x}-1}}\,dx$
3. (a) $\int ke^{3x}\sqrt{\frac{6+4e^{6x}}{k^{\frac{3}{2}}}}\,dx$
   (b) $\int_0^{3\sqrt{3}} \frac{x^2}{(4x^2+9)^{\frac{3}{2}}}\,dx$
4. (a) $\int ke^{5x}\sqrt{\frac{4-9e^{10x}}{k^4}}\,dx$
   (b) $\int_0^{0.6} \frac{x^2}{(9-25x^2)^{\frac{1}{2}}}\,dx$

5. (a) $\int \sqrt{\frac{x^2-4}{x^2}}\,dx$

   (b) $\int_{\sqrt{2}}^{2} \frac{x^2}{(x^2-1)^{\frac{1}{2}}}\,dx$

Integration by Parts

1. $\int_1^3 \sqrt{x}\arctan\sqrt{x}\,dx$
2. $\int \frac{xe^x}{(x+1)^2}\,dx$
3. $\int 2x^{17}e^{1+x^9}\,dx$
4. $\int_2^4 \sec^{-1}\sqrt{\theta}\,d\theta$
5. $\int e^{2x}\cos 3x\,dx$

Integration of Rational Functions by Partial Fraction

1. $\int \frac{11x+17}{2x^2+7x-4}\,dx$
2. $\int \frac{1}{x(x^2-1)}\,dx$
3. $\int \frac{2x^2-10x+4}{(x+1)(x-3)^2}\,dx$
4. $\int \frac{2x^2-1}{(4x-1)(x^2+1)}\,dx$
5. $\int \frac{x^3+x^2+x+2}{(x^2+1)(x^2+2)}\,dx$

Best of Luck.