United International University
School of Science and Engineering
Mid-term Examination   Trimester: summer
Course Title: Fundamental Calculus (CSE)
Course Code: Math 115   Marks: 40   Time: 2 Hours

Answer all questions

1. Differentiate the following functions: [6]

   (i). $f(x) = \sec^3\left(\frac{2}{\sqrt{1-x^2}}\right)$

   (ii). $g(x) = (x^7 - 3)^{-2} \tan\left(\frac{2}{x}\right)$

2. (a) Then use simple area formula from geometry to find the area function $A(x)$ that   [4]
   gives the area between the graph of the function $f(x) = 1 - \frac{x}{2}$ and the interval
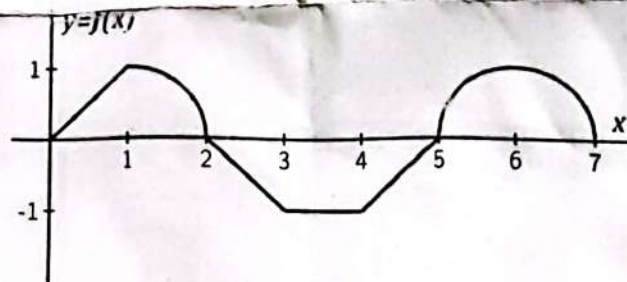 $[-1, x]$. Also, confirm that $A'(x) = f(x)$.

   (b) Evaluate the integral $\int_4^7 f(x)\,dx$, given that $f(x) = \begin{cases} |3 - x| \; ; x \leq 5 \\ 2 \; ; x > 5 \end{cases}$. Also   [6]
   verify your result by interpreting the integral geometrically.

   (c) According to the following figure evaluate $\int_0^7 f(x)\,dx$.   [4]

3. Find the area between two curves $y = 5 - x^2$ and $x = y + 1$ by (i) integrating with   [8]
   respect to x (ii) integrating with respect to y.

4. Evaluate any four of the following integrals.   [12]

   (i). $\int \frac{2\cos x}{\sec x}\,dx$

   (ii). $\int \frac{dx}{\sqrt{x}(4+x)}$

   (iii). $\int \frac{x\,dx}{4^{x^2}}$

   (iv). $\int (x^2 - 1)\sqrt{x + 1}\,dx$

   (v). $\int \ln(x^2 + 9)\,dx$

   (vi). $\int \frac{dx}{(9x^2 - 4)^{\frac{3}{2}}}$