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]

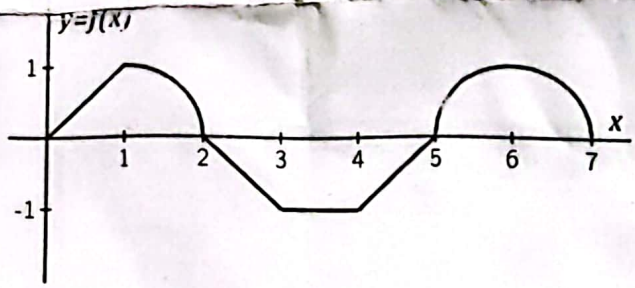
   (i). $f(x) = \sec^3\left(\frac{x}{\sqrt{1-x^2}}\right)$

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

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

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

   (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 respect to x (ii) integrating with respect to y. [8]

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). $\int \frac{xdx}{4x^2}$

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

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

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