ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
SCHOOL OF APPLIED NATURAL SCIENCE
APPLIED MATHEMATICS DEPARTMENT

Group Assignment   Max. Mark: 10%   Submission Date: 24/12/2021

1. Determine whether or not $\lim_{(x,y)\to(0,0)} \left[\frac{xy}{x^2+y^2}\right]^{1/2}$ exists. Briefly explain your answer.

2. Let $u = i - j$ and $v = 3i + 3j$. If $D_u f(1,2) = 6\sqrt{2}$ and $D_v f(1,2) = -2\sqrt{2}$, then find $f_x(1,2)$ and $f_y(1,2)$.

3. Let D be the solid bounded by the four planes $x = 0, y = 0, z = 0$ and $x + 2y + 3z = 12$ and let $f: D \longrightarrow \mathbb{R}$ be the function $f(x, y, z) = xyz$. Then, find the global maximum value of f on D.

4. a). Draw a picture of the region of integration of

$$\int_0^1 \int_{1+x}^{\sqrt{9-x^2}} dy\,dx$$

   b). Switch the order of integration in the integral and then evaluate it.

5. Let R be the region in the first quadrant bounded by the curves:

$$x^2 - y^2 = 1, \ x^2 - y^2 = 4, \ xy = 1 \text{ and } xy = 3.$$

   a. Find $du\,dv$ in terms of $dx\,dy$, where $u = x^2 - y^2$ and $v = xy$.

   b. Evaluate the integral $\iint_R (y^4 - x^4)dx\,dy$.

6. Let D be the solid inside the sphere $x^2 + y^2 + z^2 = 9$ and above the top sheet of the hyperboloid $x^2 + y^2 - z^2 = -1$. Then, evaluate the volume of D using cylindrical coordinate.