



United International University
School of Science and Engineering

Assignment- 02 Trimester: Fall 2024

Course Title: Coordinate Geometry and Vector Analysis

Course Code: Math 2201

1.	<p>a) Consider, $\mathbf{F}(x, y) = e^x \sin y \mathbf{i} + e^x \cos y \mathbf{j}$</p> <p>i) Show that \mathbf{F} is a conservative vector field on the entire xy –plane.</p> <p>ii) Find the potential function $\phi(x, y)$.</p> <p>iii) Find $\int_{(0,0)}^{(1, \frac{\pi}{2})} \mathbf{F} \cdot d\mathbf{r}$ using ii)</p> <p>b) Using Green's theorem find the value of $\oint_C \mathbf{F} \cdot d\mathbf{r}$</p> <p>Where $\mathbf{F}(x, y) = (25e^{3x} - y^3)\mathbf{i} + (5y^3 + x^3)\mathbf{j}$ and C is the closed circle with parametric equations $x = \cos t$, and $y = \sin t$.</p>
2.	Evaluate $\int_C (\mathbf{x} + \mathbf{y})d\mathbf{x} + (-\mathbf{y} - \mathbf{x})d\mathbf{y}$ along the rectangle with vertices $(0, 0), (0, 2), (2, 2)$ and $(2, 0)$.
3.	Find the volume of the solid within the cylinder $x^2 + y^2 = 16$ and between the planes $z = 0$ and $x + z = 7$.
4.	<p>Evaluate $\iint_{\sigma} 2y ds$.</p> <p>where σ is the portion of the surface $y^2 + z^2 = 4$ between $x = 0$ and $x = 3 - z$</p>
5.	<p>$\iint_{\sigma} \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F} = (2xz)\mathbf{i} + (1 - 4xy^2)\mathbf{j} + (2z - z^2)\mathbf{k}$, and σ is the surface of the solid bounded by $z = 6 - 2x^2 - 2y^2$ and the plane $z = 0$.</p>