National University of Computer & Emerging Sciences, Karachi
Spring-2025 FAST School of Computing
MT-2008 Multivariate Calculus

Assignment 3

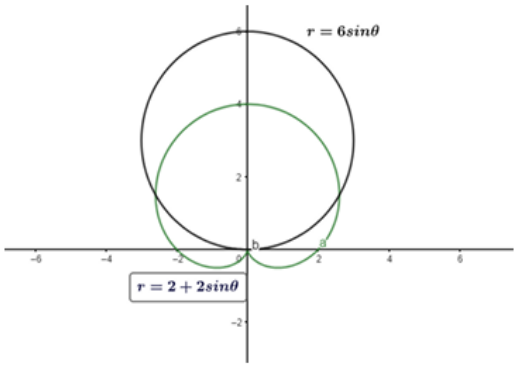
Q 1. Evaluate $\iint_D xy\,dA$, where D is the region bounded by the line $y = x - 1$ and the parabola $y^2 = 2x + 6$.

Q 2. Find the volume of the solid under the surface $z = 2x + y^2$ and above the region bounded by $x = y^2$ and $x = y^3$.

Q 3. Evaluate the integral by reversing the order of integration.

$$\int_0^1 \int_{\arcsin y}^{\pi/2} \cos x \sqrt{1 + \cos^2 x}\, dx\, dy$$

Q 4. Use double integral to find the area of the region above the x-axis, between the cardioid $r = 2 + 2sin\theta$ and circle $r = 6sin\theta$.



Q 5. Evaluate the iterated integral by converting to polar coordinates. $\iint_D 2y\,dA$, where D is the region in the first quadrant bounded above by the circle $(x-1)^2 + y^2 = 1$ and below by the line $y = x$.

Q 6. Evaluate the iterated integral.

$$\int_0^3 \int_0^1 \int_0^{\sqrt{1-z^2}} ze^y\, dx\, dz\, dy$$

Q 7. Evaluate the integral $\int_C \mathbf{F}.\,d\mathbf{r}$, where $\mathbf{F}(x,y,z) = x\mathbf{i} - z\mathbf{j} + y\mathbf{k}$ and $\mathbf{C}$ is given by

$$\mathbf{r}(t) = 2t\mathbf{i} + 3t\mathbf{j} - t^2\mathbf{k}, -1 \le t \le 1$$

Q 8. Evaluate the line integral $\int_C xyz^2\,ds$, where C is the line segment from $(-1, 5, 0)$ to $(1, 6, 4)$.

Q 9. Use Green's Theorem to evaluate the line integral along the curve C:

$\int_C (e^x + y^2)\,dx + (e^y + x^2)\,dy$, where C is the boundary of the region between $y = x^2$ and $y = x$.

Q 10. Evaluate the surface integral. $\iint_S xy\, dS$, Where S is the triangular region with vertices $(1, 0, 0), (0, 2, 0), and\ (0, 0, 2)$.