MA 102
Calculus
Tutorial–3

(1) Evaluate the iterated integral $\int_0^3 \int_{-2}^0 (x^2y - 2xy)dydx$.
(2) Find the volume of the region bounded above by the surface $z = 4 - y^2$ and below by the rectangle $R : 0 \leq x \leq 1,\ 0 \leq y \leq 2$.
(3) Sketch the region of integration and evaluate the integral $\int_0^{\pi} \int_0^{sin\ x} y\ dydx$.
(4) Find the volume of the solid that is bounded above by the cylinder $z = x^2$ and below by the region enclosed by the parabola $y = 2 - x^2$ and the line $y = x$ in the xy-plane.
(5) Which do you think will be larger, the average value of over the square $0 \leq x \leq 1, 0 \leq y \leq 1$ or the average value of $f(x, y) = xy$ over the quarter circle $x^2 + y^2 \leq 1$ in the first quadrant? Calculate them to find out.
(6) Change the Cartesian integral into an equivalent polar integral. Then evaluate the polar integral $\int_{-1}^1 \int_0^{\sqrt{1-x^2}} dydx$.
(7) Evaluate $\int_0^1 \int_0^{\pi/2} r^3 sin(u)cos(u)drdu$.
(8) Evaluate $\int_0^1 \int_{-1}^0 \int_0^{y^2} dzdydx$.
(9) Find the average value of $F(x, y, z) = x^2 + 9$ over the cube in the first octant bounded by the coordinate planes and the planes $x = 2, y = 2, z = 2$.
(10) Evaluate the cylindrical coordinate integral $\int_0^{2\pi} \int_0^1 \int_r^{\sqrt{2-r^2}} dz\ rdr\ d\theta$.
(11) Evaluate $\int_0^3 \int_0^4 \int_{x=y/2}^{y/2+1} (\frac{2x-y}{2} + \frac{z}{3})dxdydz$ by applying the transformation $u = (2x - y)/2, v = y/2, w = z/3$ and integrating over an appropriate region in uyw-space.