

MA3180 (Financial Mathematics I) Assignment 4

1. Calculate the following double integrals.

(i) $\int \int_D 3xy dx dy$, where D is bounded by $y = x$ and $y = x^2 - 4x + 4$.

(ii) $\int \int_D 4y^3 dx dy$, where D is bounded by $y = x - 6$ and $y = x^2$.

(iii) $\int \int_D ye^x dx dy$, where D is the triangular region with vertices $(0, 0)$, $(2, 4)$ and $(6, 0)$.

2. Calculate the volume of the given solid.

(i) Under the paraboloid $z = x^2 + y^2$ and above the region bounded by $y = x^2$ and $x = y^2$.

(ii) Bounded by the paraboloid $z = x^2 + y^2 + 4$ and the planes $x = 0$, $y = 0$, $z = 0$ and $x + y = 1$.

(iii) Bounded by the cylinder $y^2 + z^2 = 9$ and the planes $x = 2y$, $y = 0$ and $z = 0$ in the first octant.

(iv) Bounded by the cylinders $x^2 + y^2 = r^2$ and $y^2 + z^2 = r^2$.

3. Calculate the following integrals by changing to polar coordinates.

(i) $\int \int_D y dx dy$, where D is the region in the first quadrant bounded by the circle $x^2 + y^2 = 9$ and the lines $y = x$ and $y = 0$.

(ii) $\int \int_D x dx dy$, where D is the region in the first quadrant that lies between the circles $x^2 + y^2 = 4$ and $x^2 + y^2 = 2x$.

(iii) Calculate the volume of the solid under the paraboloid $z = x^2 + y^2$ and above the disc $x^2 + y^2 \leq 9$.