

1. Evaluate the following integrals:

(a) $\int_1^2 \int_0^2 (3y^2 - x) dx dy$

(b) $\int_0^2 \int_0^1 (x + y) dy dx$

(c) $\int_0^{\sqrt{2}} \int_{x^3-x}^{3x-x^3} 1 dy dx$

(d) $\int_0^1 \int_{x^2}^x dy dx$

(e) $\int_0^\pi \int_0^{\cos \theta} r \sin \theta dr d\theta$

2. Evaluate $\iint_R (2xy - x^2) dx dy$, where R is the rectangle bounded by $x = -1$, $x = 2$, $y = 0$ and $y = 4$.

3. Find the volume under the plane $x + y + z = 9$ and above the triangle in the x, y plane bounded by $y = 0$, $x = 3$ and $y = 2x/3$. It may be helpful to draw a diagram of the region of integration.

4. Find the volume under the surface $z = xy$ and lying over the area enclosed between the two parabolas $y = x^2$ and $y = 18 - x^2$ and the line $x = 0$.

5. Evaluate $\iint_R (3x + 4y^2) dA$, where R is the region bounded by the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.

6. Find the volume of the solid bounded by the plane $z = 0$ and the paraboloid $z = 1 - x^2 - y^2$.