PARUL UNIVERSITY
Faculty of Engineering & Technology
Department of Applied Sciences and Humanities
1ST SEMESTER B.Tech PROGRAMME (CSE, IT)
CALCULUS(03019101BS01)
ACADEMIC YEAR – 2025-26

TUTORIAL -3A MULTIPLE INTEGRATION

1	a)Evaluate $\int_2^a \int_2^b \frac{dx\,dy}{xy}$. b) $\int_0^1 \int_0^x e^{\frac{x}{y}} dy dx$
2	a) Evaluate $\int_0^{\frac{\pi}{4}} \int_0^1 r dr d\theta$. b) $\int_0^{\frac{\pi}{3}} \int_0^2 r^2 dr d\theta$
3	a)Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{a\cos\theta} r\sin\theta d\theta dr$ b) $\int_0^{\frac{\pi}{2}} \int_0^{a(1+\sin\theta)} r^2 \cos\theta d\theta dr$.
4	Change the order of the integration of following (with diagram) a) $\int_0^1 \int_0^y f(x,y) dy dx$ b) $\int_0^a \int_x^a f(x,y) dy dx$
5	Change the order of the integration of following (with diagram) a) $\int_0^\infty \int_x^\infty f(x,y) dy dx$ b) $\int_0^\infty \int_0^x f(x,y) dy dx$
6.	Change the order and evaluate the following.(with diagram) a)) $\int_0^1 \int_{x^2}^{2-x} xy\, dy dx$ b) $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} xy\, dy dx$
7.	Using the transformation$x - y = u, x + y = v$, evaluate $\iint cos\left(\frac{x-y}{x+y}\right) dx dy$ over the region bounded by the lines $x = 0,\ \ y = 0,\ \ x + y = 1$.
8.	Using the transformation $x^2 - y^2 = u,\ \ 2xy = v$, evaluate $\iint (x^2 + y^2) dx dy$ over the region in the first quadrant bounded by $x^2 - y^2 = 1, x^2 - y^2 = 2, xy = 4, xy = 2$
9.	Evaluate $\iint \frac{4xy}{x^2+y^2} e^{-x^2-y^2} dx\, dy$ over the region bounded by the circle $x^2 + y^2 - x = 0$ in the first quadrant by transforming into polar coordinates.
10.	Evaluate $\iint \sqrt{\frac{1-x^2-y^2}{1+x^2+y^2}}\ dx\, dy$ over the first quadrant of the circle $x^2 + y^2 = 1$, by transforming into polar coordinates.