Question Bank 4

School of Basics and Applied Science

Mathematics

Course Name: Multivariable Calculus   Course Code: BMA101

Date: 08-09-2019

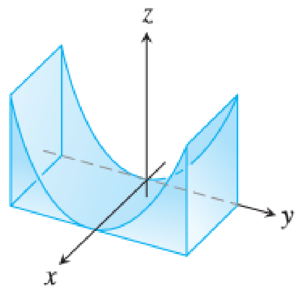
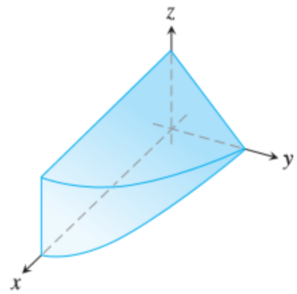
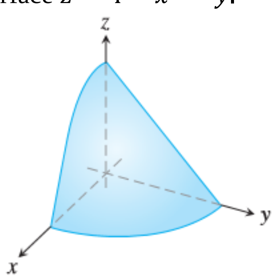
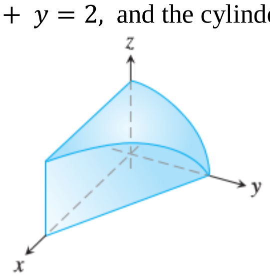
S. No.	Questions	CO	Bloom's Taxonomy Level	Difficulty Level	Competitive Exam Question Y/N	Area	Topic	Unit	Marks
1	Compute: $\int_0^2 \int_0^2 2x\, dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Rectangular region	4	2
2	Compute: $\int_0^3 \int_0^2 (4-\mathrm{y}^2) dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Rectangular region	4	2
3	Compute: $\int_{-1}^0 \int_{-1}^1 (x+y+1)\, dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Rectangular region	4	2
4	Compute: $\int_1^2 \int_0^4 2xy\, dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Rectangular region	4	2
5	Compute the double integral over the region R: $0 \le x \le 1, 0 \le y \le 2$; $\iint_R (6y^2-2x) dA$	4	K3	H	N	Double integrals in Cartesian coordinates	Rectangular region	4	6
6	Calculate $\iint_R f(x,y) dA$ for $f(x,y) = 100 - 6x^2 y$ and $R: 0 \le x \le 2, \quad -1 \le y \le 1$.	4	K3	H	N	Double integrals in Cartesian coordinates	Rectangular region	4	6
7	Compute: $\int_0^2 \int_{x^2}^{2x} (4x+2)\, dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	6
8	Compute: $\int_0^{\pi} \int_0^{\sin x} dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	6
9	Compute: $\int_0^{\pi} \int_0^{x} x \sin y\ \, dydx$	4	K2	M	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	6
10	Compute: $\int_1^2 \int_y^{y^2} dxdy$	4	K2	M	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	6

11	Integrate $f(x,y)=\frac{x}{y}$ over the region in the first quadrant bounded by the lines $y=x, y=2x$, $x=1, x=2$.	4	K3	H	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	10
12	Compute: $\int_0^1\int_0^{y^2} 3y^3e^{xy}dxdy$	4	K3	H	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	6
13	Compute: $\int_0^2\int_{y^2/4}^{(y+2)/4}(16-x^2-y^2)dxdy$	4	K3	H	N	Double integrals in Cartesian coordinates	Non-rectangular region	4	10
14	Plot the region, reverse the order of integration of the integral: $\int_0^1\int_y^1\frac{\sin x}{x}\,dxdy$	4	K2	M	N	Double integrals in Cartesian coordinates	Change order of integration	4	6
15	Plot the region, reverse the order of integration and then calculate the integral: $\int_0^1\int_y^1\frac{\sin x}{x}\,dxdy$	4	K3	H	N	Double integrals in Cartesian coordinates	Change order of integration	4	10
16	Sketch the region of integration and write an equivalent integral with the order of integration reversed for the integral $\int_0^2\int_{x^2}^{2x}(4x+2)dydx$.	4	K2	H	N	Double integrals in Cartesian coordinates	Change order of integration	4	6
17	Sketch the region of integration and write an equivalent integral with the order of integration reversed for the integral $\int_0^1\int_2^{4-2x}\,dydx$.	4	K2	H	N	Double integrals in Cartesian coordinates	Change order of integration	4	6
18	Sketch the region of integration, reverse the order of integration and evaluate the integral $\int_0^1\int_y^1 x^2e^{xy}\,dxdy$.	4	K3	H	N	Double integrals in Cartesian coordinates	Change order of integration	4	10
19	Compute: $\int_0^{\pi/2}\int_0^1 r^3\,drd\theta$	4	K2	M	N	Double integrals in Polar coordinates	Polar curves	4	2
20	Compute: $\int_0^{\pi}\int_0^{\sqrt{(\cos 2\theta)}}\,r\,drd\theta$	4	K2	M	N	Double integrals in Polar coordinates	Polar curves	4	2
21	Find the limits of integration for $f(r,\theta)$ over the region R that lies inside the cardioid $r=1+\cos\theta$ and outside the circle $r=1$.	4	K2	M	N	Double integrals in Polar coordinates	Polar curves	4	2
22	Change the Cartesian integral into polar integral and then compute the polar integral: $\int_{-1}^1\int_0^{\sqrt{1-x^2}}dydx$	4	K3	H	N	Double integrals in Polar coordinates	Change Cartesian integrals into polar	4	10

							integral s		
23	Change the Cartesian integral into polar integral and then compute the polar integral: $\int_0^1 \int_0^{\sqrt{1-y^2}} (x^2+y^2)\, dxdy$	4	K3	H	N	Double integrals in Polar coordinates	Change Cartesi an integral s into polar integral s	4	1 0
24	Change the Cartesian integral into polar integral and then compute the polar integral: $\int_0^2 \int_0^{\sqrt{4-y^2}} (x^2+y^2)\, dxdy$	4	K3	H	N	Double integrals in Polar coordinates	Change Cartesi an integral s into polar integral s	4	1 0
25	Change the Cartesian integral into polar integral and then compute the polar integral: $\int_1^{\sqrt{3}} \int_1^{x} dydx$	4	K3	H	N	Double integrals in Polar coordinates	Change Cartesi an integral s into polar integral s	4	1 0
26	Change the Cartesian integral into polar integral and then compute the polar integral: $\int_0^6 \int_0^{y} x\, dxdy$	4	K3	H	N	Double integrals in Polar coordinates	Change Cartesi an integral s into polar integral s	4	1 0
27	Evaluate $\iint_R e^{x^2+y^2} dydx$ where R is the semicircular region bounded by the x-axis and the curve $y=\sqrt{1-x^2}$.	4	K4	H	N	Double integrals in Polar coordinates	Change Cartesi an integral s into polar integral s	4	1 0
28	Find the volume of the region bounded above by the elliptical paraboloid $z=10+x^2+3y^2$ and below by the rectangle $R: 0 \le x \le 1, 0 \le y \le 2$.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	1 0
29	Find the volume of the region bounded above by the paraboloid $z=x^2+y^2$ and below by the square $R: -1 \le x \le 1, -1 \le y \le 1$.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	1 0
30	Find the volume of the region bounded above by	4	K4	H	N	Application	Area	4	1

	the plane $z = 2 - x - y$ and below by the square $R: 0 \leq x \leq 1, 0 \leq y \leq 1$.					of Double integral	and volume by double integral		0
31	Find the volume of the region bounded above by the surface $z = 2\sin x \cos y$ and below by the rectangle $R: 0 \leq x \leq \pi/2, 0 \leq y \leq \pi/4$.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
32	Find a value of the constant k so that $\int_1^2 \int_0^3 kx^2 y dx\, dy = 1$.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	6
33	Find the volume of the prism whose base is the triangle in the *xy*-plane bounded by the *x*-axis and the lines $y = x, x = 1$ and whose top lies in the plane $z = f(x, y) = 3 - x - y$.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
34	Find the volume of pastry that lies beneath the surface $z = 16 - x^2 - y^2$ and above the region R bounded by the curve $y = 2\sqrt{x}$, the line $y = 4x - 2$, and the *x*-axis.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
35	Find the volume of the region bounded above by the paraboloid $z = x^2 + y^2$ and below by the triangle enclosed by the lines $y = x, x = 0$, and $x + y = 2$ in the *xy*-plane.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
36	Find the area of the region R bounded by $y = x$ and $y = x^2$ in the first quadrant using double integral.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
37	Find the area of the region R enclosed by the parabola $y = x^2$ and the line $y = x + 2$ using double integral.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
38	Find the area of the playing field described by $R: -2 \leq x \leq 2, -1 - \sqrt{4 - x^2} \leq y \leq 1 + \sqrt{4 - x^2}$, using Fubini's Theorem and simple geometry.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
39	Find the area enclosed by the lemniscate $r^2 = 4\cos 2\theta$.	4	K4	H	N	Application of Double	Area and	4	10

						integral	volume by double integral		
40	Find the volume of the solid region bounded above by the paraboloid $z = 9 - x^2 - y^2$ and below by the unit circle in the *xy*-plane.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
41	Using polar integration, find the area of the region R in the *xy*-plane enclosed by the circle $x^2 + y^2 = 4$, above the line $y = 1$, and below the line $y = \sqrt{3}x$.	4	K4	H	N	Application of Double integral	Area and volume by double integral	4	10
42	Evaluate: $\int_0^1 \int_0^1 \int_0^1 dz\, dy\, dx$	4	K3	H	N	Triple integrals in Cartesian coordinates	Triple integral	4	6
43	Evaluate: $\int_0^2 \int_0^2 \int_0^2 xyz\, dx\, dy\, dz$	4	K3	H	N	Triple integrals in Cartesian coordinates	Triple integral	4	6
44	Evaluate: $\int_0^1 \int_x^1 \int_0^{y-x} dz\, dy\, dx$	4	K3	H	N	Triple integrals in Cartesian coordinates	Triple integral	4	6
45	Evaluate: $\int_0^1 \int_0^{1-x} \int_{x+z}^1 dy\, dz\, dx$	4	K3	H	N	Triple integrals in Cartesian coordinates	Triple integral	4	6
46	Evaluate the triple integral $\iiint_Q 2xe^y \sin z\, dV$, where Q is the rectangular box defined by $Q = \{(x, y, z) \mid 1 \le x \le 2, 0 \le y \le 1, 0 \le z \le \pi\}$.	4	K4	H	N	Triple integrals in Cartesian coordinates	Triple integral	4	10
47	Find the volume of the cube of side 2 unit using triple integral.	4	K4	H	N	Application of Triple integrals	Volume by triple integral	3	10
48	Find the volume of the region enclosed by the surfaces $z = x^2 + 3y^2$ and $z = 8 - x^2 - y^2$.	4	K4	H	N	Application of Triple integrals	Volume by triple integral	3	10
49	Find the volume of the region enclosed by the cylinder $z = y^2$ and by the planes $x = 0, x = 1, y = -1, y = 1$.	4	K4	H	N	Application of Triple integrals	Volume by triple integral	3	10

									
50	Find the volume of the region in the first octant bounded by the coordinate planes, the plane $y + z = 2,$ and the cylinder $x = 4 - y^2$. 	4	K4	H	N	Application of Triple integrals	Volume by triple integral	3	10
51	Find the volume of the region in the first octant bounded by the coordinate planes, and the surface $z = 4 - x^2 - y$. 	4	K4	H	N	Application of Triple integrals	Volume by triple integral	3	10
52	Find the volume of the region in the first octant bounded by the coordinate planes, the plane $x + y = 2,$ and the cylinder $y^2 + 4z^2 = 16$. 	4	K4	H	N	Application of Triple integrals	Volume by triple integral	3	10

Signature of Course Coordinator/DC:

Signature of Dean:

IQAC: