King Fahd Univ. of Petroleum and Minerals
Faculty of Sciences
Department of Mathematics and Statistics

FINAL EXAM
(MATH. 201-071 Sections 3 & 7)

Name:
ID:

Prob. 1
Sketch the curve of $r = 4(1 - \cos \theta)$ and setup the integral to find the arc length of this curve.
Prob. 2
If \( \vec{a} = (3, 0, -1) \), find \( \vec{b} \) such that \( \| \text{Proj}_{\vec{a}} \vec{b} \| = 2 \)
Prob. 3
Find the point on the circle $x^2 + y^2 = 45$ that is closest to and farthest from the point $(1, 2)$
Prob. 4

Evaluate $\int_0^1 \int_{4x}^4 e^{-y^2} dy \, dx$
Prob. 5
Sketch and find the area of the region inside the polar curve \( r = 2 + 2 \cos \theta \)
and to the right of the polar curve \( r \cos \theta = 3/2 \).
Prob. 6
Find the volume of the solid lying under \( z = y^2 - x^2 \) and above the square \( R = [-1, 1] \times [1, 3] \)
Prob. 7
Evaluate the double integral \( \int_0^2 \int_{y-x/2}^{y+2} e^x \, dy \, dx \) where \( D \) is the triangle with vertices \((0,0)\), \((2, 4)\) and \((6, 0)\).
Prob. 8

Sketch the region of integration and change the order of integration
(a) $\int_{0}^{1} \int_{0}^{x} f(x, y)dydx$ and (b) $\int_{0}^{1} \int_{y^{2}}^{2-y} f(x, y)dydx$
Prob. 9
Use polar coordinates to find the volume of the solid under \(6x+4y+z = 12\) and above the disk with boundary circle \(x^2 + y^2 = y\)
Prob. 10
Evaluate \( \iiint_E x \, dV \) where \( E \) is bounded by \( x = 0, y = 0, z = 0 \) and \( 3x + 2y + z = 6 \)
Prob. 11
(a) Sketch the solid whose volume is given by the integral \( \int_{0}^{1} \int_{0}^{\pi/2} \int_{0}^{3} rdzd\theta dr \)
(b) Same question for \( \int_{0}^{\pi/3} \int_{0}^{\pi} \int_{0}^{2\pi} \rho^2 \sin \phi d\rho d\theta d\phi \)