(x, y, z)

$\vec{w}$

R

$\vec{v}$

$(x, y, 0)$

$\left| \det \begin{pmatrix} \vec{v} & \vec{w} \end{pmatrix} \right| = \text{area } R$

MATH 122 MATHEMATICAL ANALYSIS-II
SAMPLE MIDTERM EXAM2

Name: _____

Q1 Using a double integral, find the volume under the surface $z = x^2 \cos y + xy$ for the given region by $R = \{(x, y) = 0 \le x \le 2, 0 \le y \le \dfrac{\pi}{2}\}$.

Q2 Find the volume of the solid bounded by the coordinate planes and the plane $2x + 3y + z = 6$.

Q3 Evaluate $\displaystyle\int_0^3 \int_x^{4x} \int_0^{2y} xyz\,dz\,dy\,dx$

Q4 Evaluate $\displaystyle\int_0^1 \int_0^{2x} xy\,dy\,dx$

Q5 Evaluate $\displaystyle\int_0^\pi \int_x^\pi \dfrac{\cos y}{y}\,dy\,dx$

Q6 Let $R = [0, 2] \times [1, 3]$. Then compute $\int\int_R xy\,dx\,dy$

Q7 Find the volume of the solid bounded by $z = 4 - x^2 - y^2$ and $z = 0$.

Q8 Divide 30 into three parts such that the continued product of the first, square of the second and the cube of the third may be maximum.

Q9 Find the critical points of $f(x, y) = x^2 + 2xy$. Use the second derivative test for local extrema to determine whether the point is a local maximum, a local minimum, or a saddle point.

Q10 Find an equation of the tangent plane to the given surface $z = \sin(x + y)$ at the point $(1, -1, 0)$

Q11 Find the directional derivative of the function $f(x, y, z) = x + y + e^z$ at the point $(1, 0, 1)$ in the direction of the vector $u = (1, -1, 1)$.

Q12 Find all the second partial derivatives of $z = e^{-x}(x \sin y - y \sin x)$.