Math 20E Homework Assignment 1
Due 11:00pm Monday, October 3, 2022

1. Find an equation for the tangent plane to \( f(x, y, z) = \frac{xyz}{x^2 + y^2 + z^2} \) at \((x_0, y_0, z_0) = (1, 0, 1)\).

2. Compute the matrix of partial derivatives of \( f(x, y, z) = (x + y, x - y, xy)\).

3. Let \( w = x^2 + y^2 + z^2\), \( x = uv\), \( y = u \cos(v)\), and \( z = u \sin(v)\). Use the chain rule to find \( \frac{\partial w}{\partial u} \) when \((u, v) = (1, 0)\).

4. Let \( g(u, v) = (e^u, u + \sin(v)) \) and \( f(x, y, z) = (xy, yz)\). Compute \( D(g \circ f)(0, 1, 0) \) using the chain rule.

5. Evaluate the iterated integral \( \int_1^3 \int_1^2 \frac{xy}{(x^2 + y^2)^{\frac{3}{2}}} \, dx \, dy \).

6. Evaluate the double integral \( \iint_R (x^2y^2 + x) \, dy \, dx \), where \( R = [0, 2] \times [-1, 0] \).

7. Compute the volume of the region over the rectangle \([0, 1] \times [0, 1]\) and under the graph \( z = xy\).

8. Compute the volume of the solid bounded by the \(xz\) plane, the \(yz\) plane, the \(xy\) plane, the planes \( x = 1 \) and \( y = 1 \), and the surface \( z = x^2 + y^4\).

9. Evaluate the double integral \( \iint_D xy \, dA \), where \( D \) is the triangular region whose vertices are \((0, 0), (0, 2), (2, 0)\).

10. Evaluate \( \iint_D y \, dA \), where \( D \) is the set of points \((x, y)\) such that \( 0 \leq \frac{2x}{\pi} \leq y \leq \sin(x)\).