Math 20E Homework Assignment 1
Due 11:00pm Tuesday, October 10, 2023

1. Find an equation for the tangent plane to $f(x,y,z) = \dfrac{xyz}{x^2+y^2+z^2}$ 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 $\mathbf{D}(g\circ f)(0,1,0)$ using the chain rule.
5. Evaluate the iterated integral $\displaystyle\int_1^3 \int_1^2 \frac{xy}{(x^2+y^2)^{\frac{3}{2}}}\, dx\, dy$.
6. Evaluate the double integral $\displaystyle\iint_R \left(x^2y^2 + x\right)\, dy\, dx$, 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 $\displaystyle\iint_D xy\, dA$, where D is the triangular region whose vertices are $(0,0)$, $(0,2)$, $(2,0)$.
10. Evaluate $\displaystyle\iint_D y\, dA$, where D is the set of points (x,y) such that $0 \le \frac{2x}{\pi} \le y \le \sin(x)$.