Math 20E Homework Assignment 1
Due 11:00pm Tuesday, April 16, 2024

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. 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.

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

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

5. 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 $z = x^2 + y^4$.

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

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

8. Change the order integration and evaluate:

$$\int_{y=0}^{1} \int_{x=y}^{1} \sin\left(x^2\right)\, dx\, dy.$$

9. Change the order integration and evaluate:

$$\int_{y=0}^{1} \int_{x=\sqrt{y}}^{1} e^{x^3}\, dx\, dy.$$

10. Evaluate the integral $\displaystyle\iiint_W z\, dx\, dy\, dz$; where W is the region bounded by $x = 0$, $y = 0$, $z = 0$, $z = 1$, and the cylinder $x^2 + y^2 = 1$, with $x \geq 0$, $y \geq 0$.