

Math 205
Quiz 3 for Practice

1. (6 points) Find an equation for the plane through the points $(1, 0, -2)$, $(2, 1, 1)$, $(1, 4, 3)$.
2. (4 points) Evaluate the determinant for the 4×4 matrix

$$\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 2 & 3 & 4 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

3. (6 points) Find an equation for the plane tangent to the surface $z = \sin(xy) + 4x$ at the point where $x = 1$ and $y = \pi$.
4. (9 points)
 - (a) Find the second-order Taylor polynomial $Q(x, y)$ for the function $f(x, y) = \cos 2x + xy$ using the base point $(0, 1)$.
 - (b) Use this Taylor polynomial to find an approximate numerical value for $f(0.1, 0.9)$.
5. (15 points) Let $F(x, y, z) = e^{x^2+y^2-z}$.
 - (a) Find the gradient vector for F at the point $(1, 1, 2)$.
 - (b) Find the directional derivative for F at the point $(1, 1, 2)$ in the direction given by the vector $\vec{i} + \vec{j} + \vec{k}$.
 - (c) At the point $(1, 1, 2)$, in which direction does F decrease most rapidly?