

Examples.

1. Find all partials and second partials of $f(x, y) = 3xy - x^2 - y^2$ at the origin.
2. What is the plane tangent to $f(x, y) = x^3 - 3xy^2$ at $(2, 1, 2)$?
3. What is the plane tangent to

$$f(x, y) = \frac{7xy}{e^{x^2+y^2}}$$

at $x = 1, y = 1$?

When is the tangent plane parallel to the xy -plane?

4. If $z(x, y) = x^3 - 3xy^2$ and $x = t^2 - w^2, y = t + w$, what is $\frac{\partial z}{\partial t}$? What is $\frac{\partial z}{\partial w}$?
5. If $f(x, y) = xy^2 - x^2y, y(x, t) = t + \sin x$, what is $\frac{\partial f}{\partial x}$?
What is $\frac{\partial^2 f}{\partial x^2}$?
6. If we have $f(x, y, z), x(v, t), y(v, t), z(v, t), v(u, t)$, what does the dependencies look like?
What is $\frac{\partial f}{\partial t}$?