

1. [EC 11.3.{10,12,18,22}] Find the first partial derivatives of the function.

(a) $z = y \ln x$

(c) $f(x, y) = \int_y^x \cos(t^2) dt$

(b) $f(x, y) = x^y$

(d) $w = \sqrt{r^2 + s^2 + t^2}$

2. [EC 11.3.38] Use implicit differentiation to find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for $yz = \ln(x + z)$.

3. [EC 11.3.44] Find all four second partial derivatives of $f(x, y) = \ln(3x + 5y)$.
4. [EC 11.4.4] Find the equation of the tangent plane to $z = y \ln x$ at $(1, 4, 0)$.
5. [EC 11.4.30] The pressure, volume, and temperature of a mole of an ideal gas are related by the equation $PV = 8.31T$, where P is measured in kilopascals, V in liters, and T in kelvins. Use differentials to find the approximate change in the pressure if the volume increases from 12 L to 12.3 L and the temperature decreases from 310 K to 305 K.