Find an equation of the tangent plane to the surface $z = y \ln(x)$ at the point $(1, 4, 0)$.

**Solution:**

$$z_x = y \frac{\partial}{\partial x} (\ln(x)) + \ln(x) \frac{\partial}{\partial x} (y) = \frac{y}{x}$$

$$z_y = y \frac{\partial}{\partial y} (\ln(x)) + \ln(x) \frac{\partial}{\partial y} (y) = \ln(x)$$

so $z_x (1, 4) = 4$ and $z_y (1, 4) = 0$. This means that an equation of the tangent plane at the indicated point is

$$z - 0 = 4(x - 1) + 0(y - 4)$$

or simply $z = 4x - 4$. 