

**TEST #2 Make Up Problem**  
**(SHOW ALL WORK)**

For certain constants  $c$  and  $k$ , the tangent plane to the surface described by the function  $f(x, y) = e^x y + ky$  at the point  $(0, 2)$  is given by  $z = 2x + 5(y - 2) + c$ .

(a) Find the value of the constant  $k$ .

$$\begin{aligned} f_x(x, y) &= e^x y & f_x(0, 2) &= e^0 \cdot 2 = 2 \\ f_y(x, y) &= e^x + k & f_y(0, 2) &= e^0 + k = 1 + k = 5 \end{aligned}$$

$\Rightarrow k = 5 - 1 = \boxed{4}$ .

(b) Find the equation of the tangent plane to the surface at  $(\ln 2, 6)$ .

$$\begin{aligned} L(x, y) &= f(a, b) + f_x(a, b)(x - a) + f_y(a, b)(y - b) \\ &= (e^{\ln 2} \cdot 6 + 4 \cdot 6) + (e^{\ln 2} \cdot 6)(x - \ln 2) + (e^{\ln 2} + 4)(y - 6) \\ &= \boxed{36 + 12(x - \ln 2) + 6(y - 6)}, \\ &\text{or } 12x + 6y - 12\ln 2. \end{aligned}$$