

## Calculus Stewart Ch14 Problem Plus

5. Suppose  $f$  is a differentiable function of one variable. Show that all tangent planes to the surface  $z = xf\left(\frac{y}{x}\right)$  intersects common point.

Solution

$$\nabla F = \left( f\left(\frac{y}{x}\right) - \frac{y}{x}f'\left(\frac{y}{x}\right), f'\left(\frac{y}{x}\right) - 1 \right)$$

$$\left( f\left(\frac{y_0}{x_0}\right) - \frac{y_0}{x_0}f'\left(\frac{y_0}{x_0}\right) \right)(x - x_0) + \left( f'\left(\frac{y_0}{x_0}\right) - 1 \right)(y - y_0) = z - z_0$$

$$\Rightarrow \left( f\left(\frac{y_0}{x_0}\right) - \frac{y_0}{x_0}f'\left(\frac{y_0}{x_0}\right) \right)x + \left( f'\left(\frac{y_0}{x_0}\right) - 1 \right)y = z$$

$\therefore$  intersects  $(0,0,0)$