

$$R = \ln(u^2 + v^2 + w^2), \quad u = x + 2y, \quad v = 2x - y, \quad w = 5xy \quad \Rightarrow$$

$$\frac{\partial R}{\partial x} = \frac{\partial R}{\partial u} \frac{\partial u}{\partial x} + \frac{\partial R}{\partial v} \frac{\partial v}{\partial x} + \frac{\partial R}{\partial w} \frac{\partial w}{\partial x} = \frac{2u}{u^2 + v^2 + w^2} \quad (1)$$

$$+ \frac{2v}{u^2 + v^2 + w^2} \quad (2) + \frac{2w}{u^2 + v^2 + w^2} \quad (5y) = \frac{2u + 4v + 10wy}{u^2 + v^2 + w^2},$$

$$\frac{\partial R}{\partial y} = \frac{\partial R}{\partial u} \frac{\partial u}{\partial y} + \frac{\partial R}{\partial v} \frac{\partial v}{\partial y} + \frac{\partial R}{\partial w} \frac{\partial w}{\partial y} = \frac{2u}{u^2 + v^2 + w^2} \quad (2)$$

$$+ \frac{2v}{u^2 + v^2 + w^2} \quad (-1) + \frac{2w}{u^2 + v^2 + w^2} \quad (5x) = \frac{4u - 2v + 10wx}{u^2 + v^2 + w^2}.$$

When  $x = y = 2$  we have  $u = 6$ ,  $v = 2$ , and  $w = 20$ , so

$$\frac{\partial R}{\partial x} = \frac{21}{22} \quad \text{and} \quad \frac{\partial R}{\partial y} = \frac{21}{22}.$$