$R = 8\Omega$

Find δP where E decreases by 5 volts & R increases by 0.2Ω

soln

$$\delta P = \frac{\partial P}{\partial E}\delta E + \frac{\partial P}{\partial R}\delta R$$

$$\frac{\partial P}{\partial E} = \frac{E^2}{R} \qquad P = E^2R^{-1}$$

$$\frac{\partial P}{\partial E} = 2ER^{-1} = \frac{2E}{R}$$

$$\frac{\partial P}{\partial R} = \frac{-1E^2}{R^2} = \frac{-E^2}{R^2}$$

$$\partial P = \frac{2(200)}{8}(-5) + \frac{(200)^2}{(8)^2}(0.2)$$

$$\partial P = -250 + 125$$

$$\partial P = -125\ v^2 \Omega.$$

(e) $y = \dfrac{kwd^4}{t^3}$

find ∂y if $w = \pm 3\%$, $d = \pm 5/2\ \%$ & $t = \pm 4\%$

Soln

$$y = \frac{kwd^4}{t^3},\quad y = kwd^4 t^{-3}$$

$$\frac{\partial y}{\partial k} = \frac{wd^4}{t^3},\quad \frac{\partial y}{\partial w} = \frac{kd^4}{t^3},\quad \frac{\partial y}{\partial d} = \frac{4kwd^3}{t^3}$$

$$\frac{\partial y}{\partial t} = -3kwd^4 t^{-4}.\quad \frac{\partial y}{\partial t} = \frac{-3kwd^4}{t^4}$$

$$\delta y = \frac{\partial y}{\partial w}\delta w + \frac{\partial y}{\partial d}\delta d + \frac{\partial y}{\partial t}\delta t$$

$$\delta y = \frac{Kd^4}{t^3}\cdot\frac{3w}{100} + \frac{4Kwd^3}{t^3}\cdot\frac{\frac{5}{2}d}{100} - \frac{3Kwd^4}{t^4}\cdot\frac{4t}{100}$$

$$\delta y = \frac{3wKd^4}{100t^3} + \frac{10Kwd^4}{100t^3} - \frac{12Kwd^4}{t^3 \times 100}$$

$$\delta y = \frac{wKd^4}{100t^3}(3+10-12)$$

$$\delta y = \frac{wKd^4}{t^3}\cdot\frac{1}{100}$$

$\delta y = 1\%$ of y.