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Assignment

(i.) $P = \frac{E^2}{R}$

$$dp = \frac{dp}{dE} \times dE + \frac{dp}{dR} \times dR$$

$$\frac{dp}{dE} = \frac{2E}{R} \quad ; \quad \frac{dp}{dR} = -\frac{E^2}{R^2}$$

$$\therefore dp = \frac{2E}{R} dE - \frac{E^2}{R^2} dR$$

So, $E = 200$ volts $\quad dE = -5$ volts

$R = 8$ ohms $\quad dR = +0.2$ ohms

$$dp = \frac{2(250)}{8} \times (-5) - \frac{(250)^2}{8^2}(0.2)$$

$$dp = -250 - 125$$

$$dp = -375$$

ie P decreases by 375 volts.

(ii.) $y = \frac{kwd^4}{t^3}$

$$dy = \frac{dy}{dk} \times dk + \frac{dy}{dw} \times dw + \frac{dy}{dd} \times dd + \frac{dy}{dt} \times dt$$

$$\frac{dy}{dk} = 0 \; ; \; \frac{dy}{dw} = \frac{kd^4}{t^3} \; ; \; \frac{dy}{dd} = \frac{4kwd^3}{t^3} \; ; \; \frac{dy}{dt} = \frac{-3kwd^4}{t^4}$$

Since k = constant

$$\frac{dy}{y} = \frac{kd^4}{t^3}\left(\frac{3w}{100}\right) + \frac{4kwd^3}{t^3}\left(\frac{1}{40}\right) + \left(\frac{-3kwd^4}{t^4} \times \frac{4t}{100}\right)$$

$$dy = \frac{kwd^4}{t^3}\left(\frac{3}{100}\right) + \frac{kwd^4}{t^3}\left(\frac{4}{40}\right) - \frac{kwd^4}{t^3}\left(\frac{12}{100}\right)$$

$$dy = \frac{kwd^4}{t^3}\left(\frac{3}{100} + \frac{4}{40} - \frac{12}{100}\right)$$

$$dy = f\left(\frac{1}{100}\right)$$

ie y increases by 1 percent.