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Elect/Elect
ENG281

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

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

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

$$\partial P = \frac{2E}{R} \cdot \partial E + \frac{(E^2)}{R^2} \cdot \partial R$$

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

$$\partial P = \frac{-2000}{8} - \frac{8000}{64} = -250 - 125$$

$$= -125$$

$\therefore$ ∂P (Change in P) $= -375$ watts

$$\delta P = \frac{-2000}{8} - \frac{8000}{64} = -250 - 125$$
$$= -125$$
$$\therefore \delta P \text{ (Change in P)} = -375 \text{ watts}$$

2) $y = \frac{kwd^4}{t^3}$ $\quad \therefore y = kwd^4t^{-3}$

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

$$\frac{\delta y}{\delta k} = \frac{wd^4}{t^3} \quad \frac{\delta y}{\delta w} = \frac{kd^4}{t^3} \quad \frac{\delta y}{\delta d} = \frac{4d^3kw}{t^3}$$

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

$$\delta w = \frac{3}{100} \text{ of } w = \frac{3w}{100}$$

$$\delta d = 5/3 - 100 \text{ of } d = 5/2 \times \frac{1}{100} = \frac{5}{200} = \frac{5d}{200}$$

$$\delta t = 4/100 \text{ of } t = 4t/100$$

$$\delta y = 0 + \frac{kd^4}{t^3} \times \frac{3w}{100} + \frac{4d^3kw}{t^8} \times \frac{5d}{200} - \frac{3kwd^4}{t^2} \times \frac{4t}{100}$$

$$\delta y = \frac{kd^4w}{t^3} \times \frac{3}{100} + \frac{d^4kw}{t^3} \times \left(\frac{20}{200}\right) - \frac{kwd^4}{t^3} \times \left(\frac{12}{100}\right)$$

$$\delta y = \frac{kwd^4}{t^3}\left(\frac{3}{100} + \frac{20}{200} - \frac{12}{100}\right)$$

$$\delta y = \frac{kwd^4}{t^3}\left(\frac{2}{200}\right) = \frac{kwd}{t^3}\left(\frac{1}{100}\right)$$

$$\delta y = y\,(1/100)$$

Percentage change in $y = \pm$ 1 Percent of y