

$$4.3 a) i) P = V I \cos f$$

law of propagation of error

$$\epsilon_P = \left(\left(\frac{\partial P}{\partial V} \epsilon_V \right)^2 + \left(\frac{\partial P}{\partial I} \epsilon_I \right)^2 + \left(\frac{\partial P}{\partial f} \epsilon_f \right)^2 \right)^{1/2} =$$

$$\epsilon_P = \left(I^2 \cos^2 f \cdot \epsilon_V^2 + V^2 \cos^2 f \epsilon_I^2 + \sin^2 f V I^2 \epsilon_f^2 \right)^{1/2}$$

$$ii) V, f \text{ known } P_{V,f} = 0,5$$

Area

$$\epsilon_P = \left(\left(\frac{\partial P}{\partial V} \epsilon_V \right)^2 + \left(\frac{\partial P}{\partial I} \epsilon_I \right)^2 + \left(\frac{\partial P}{\partial f} \epsilon_f \right)^2 + 2 \cdot \frac{\partial P}{\partial V} \frac{\partial P}{\partial f} P_{V,f} \epsilon_V \epsilon_f \right)^{1/2} \Rightarrow$$

$$\epsilon_P = \left(I^2 \cos^2 f \epsilon_V^2 + V^2 \cos^2 f \epsilon_I^2 + V^2 I^2 \sin^2 f \epsilon_f^2 - \cancel{\text{nonzero}} V I^2 \cos f \sin f \epsilon_f \epsilon_V \right)^{1/2}$$