$P = a - cQ$ use $\frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$

Exercise 2.A:

2.A.1) Given a demand function by $p = a - bQ$, derive the formula for the elasticity of demand, and show that the third property holds

$$P = a - bQ$$
$$\frac{P - a}{-b} = Q$$
$$-\frac{P}{b} + \frac{a}{b} = Q$$
$$-\frac{1}{b}P + \frac{a}{b} = Q$$
$$\frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$$
$$PED = -\frac{1}{b} \times \left(\frac{P_0}{\frac{P - a}{-b}} \right)$$

$$P = a - cQ$$
$$\frac{P - a}{-c} = Q$$
$$-\frac{P}{c} + \frac{a}{c} = Q$$
$$-\frac{1}{c}P + \frac{a}{c} = Q$$
$$PED = \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$$
$$PED = -\frac{1}{c} \times \left(\frac{P_0}{\frac{P - a}{-c}} \right)$$

2.A.2) Given the market supply $p = c + dQ$ where $d \geq 0$, show that
(i) elasticity of supply is always greater than 1 if $c > 0$,
(ii) elasticity of supply is always eqaul to 1 if $c = 0$,
(iii) elasticity of supply is always less to 1 if $c < 0$.

∮ Point PES

Hint: use $\frac{\% \Delta Q_s}{\% \Delta P} = \frac{\frac{Q_1 - Q_0}{Q_0}}{\frac{P_1 - P_0}{P_0}}$

i) $d = 1$, $c > 0$; $c = 2$

$$P = 2 + Q$$
$$Q = P - 2 \quad (4, 6)$$
$$4 = P - 2 \quad (8, 10)$$
$$6 = P$$
$$8 = P - 2$$
$$10 = P$$
$$PES = \frac{\frac{8-4}{4}}{\frac{10-6}{6}} = 1.5$$

∴ Elasticity of supply is greater than 1 $(1.5 > 1)$ when $c > 0$

ii) $d = 2$, $c = 0$

$$P = 2Q$$
$$\frac{1}{2}P = Q \quad (2, 4)$$
$$P = 4$$
$$(6, 12)$$
$$\frac{1}{2}P = 6$$
$$P = 12$$
$$PES = \frac{\frac{6-2}{2}}{\frac{12-4}{4}} = 1$$

∴ Elasticity of supply is equal to 1 $(1 = 1)$ when $c = 0$

iii) $d = 2$, $c = -4$

$$P = -4 + 2Q$$
$$P + 4 = 2Q$$
$$\frac{1}{2}P + 2 = Q$$
$$\frac{1}{2}P + 2 = 4 \quad (4, 4)$$
$$P = 4$$
$$\frac{1}{2}P + 2 = 6 \quad (6, 8)$$
$$P = 8$$
$$PES = \frac{\frac{6-4}{4}}{\frac{8-4}{4}} = 0.5$$

∴ Elasticity is less than 1 $(0.5 < 1)$ when $c < 0$