

15.2

(#1)

a) i) $P = P_0 (1.05)^t$

$$P_0 (1.05)^t = P_0 e^{rt} = P_0 (e^r)^t$$

$$\therefore e^r = 1.05$$

$$r = \ln 1.05 = 0.049$$

$$P = P_0 e^{0.049t}$$

ii) $P = P_0 e^{0.049t}$

$$\frac{dP}{dt} = \frac{d}{dt} (P_0 e^{0.049t})$$

$$\frac{dP}{dt} = P_0 e^{0.049t} \times 0.049 = 0.049 P_0 e^{0.049t}$$

iii) $\frac{dP}{dt} = 0.049 \underbrace{P_0 e^{0.049t}}_P$

$$\frac{dP}{dt} = 0.049 P \quad \therefore k = 0.049$$

b) i) $P = P_0 e^{0.05t}$

$$\frac{dP}{dt} = 0.05 P_0 e^{0.05t} \quad \therefore k = 0.05$$

ii) after 1 year, $t=1$

$$P = P_0 e^{0.05(1)} = P_0 (1.051)$$

$$P(1) = P_0 (1 + 0.051)$$

\therefore after 1 year, grew by 5.1%