

$$b) \frac{dy}{dt} = y + 1 \quad (\text{substitute } P = y + 1)$$

$$\frac{dy}{dt} = \frac{d(P-1)}{dt} = \frac{dP}{dt} = P$$

$$\text{so, } P = Ce^t$$

$$y + 1 = Ce^t$$

$$\boxed{y = Ce^t - 1}$$

(#17)

a)  $N = \#$  of moles of A

$800 - N = \#$  of moles of B

rate of reaction = rate of change in ~~A~~ substance A

$$\frac{dN}{dt} = -kN(800 - N)$$

$$\frac{dN}{dt} < 0$$

b) want highest rate of change (set deriv. = 0)

$$\text{rate} = \frac{dN}{dt} = -kN(800 - N)$$

$$\frac{d(\text{rate})}{dN} = \frac{d}{dN} (-800kN + kN^2) \quad k = \text{constant}$$

$$0 = \frac{d}{dN} (-800kN + kN^2)$$

$$0 = -800k + 2kN$$

$$800k = 2kN$$

$$800 = 2N$$

$$\Rightarrow \boxed{N = 400 \text{ moles}}$$

@  $N = 400$ ,  $\frac{dN}{dt}$  is minimum

$\therefore$  rate of reaction is fastest!