CHS

19P-0094 RK2 Method

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Initial Population = 100

where $\Delta t = 0$

Let $\Delta t = 2$

$$P(t=2) = P(t=0) + \Delta P \quad \text{---(i)}$$

(initial population)

By using Euler Method:

$$\Delta P = \text{Slope} * \Delta t$$

As we know

$$\text{Slope} = dP/dt = r.P$$

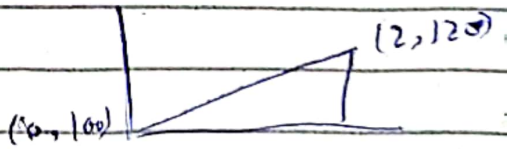
$$\text{Slope} = 0.1\,(100) \quad \therefore r = 0.1$$

$$\Delta P = 10 \times 2 = 20 \quad \therefore P = 100$$

Putting the value of ΔP in eq (i)

$$P(t=2) = 100 + 20$$

$$= 120$$



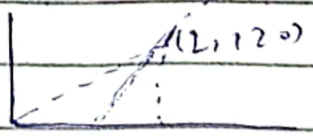
Now let $\Delta t = 4$

$$P(t=4) = P(t=2) + \Delta P$$

$$\Delta P = \text{Slope} = r.P$$

$$= 0.1 \times 120$$

$$\Delta P = 12$$



2nd slope

Now taking avg of both slopes

$$\frac{\text{slope}|_{t=0} + \text{slope}|_{t=2}}{2}$$

$\frac{10+12}{2} = 11$ $\Rightarrow$ new slope

$P(t=2) = P(t=0) + \Delta P$

$\Delta P = \text{slope} * \Delta t$

$\Delta P = 11 \times 2 = 22$

$P(t=2) = 100 + 22 = 122$

Lets find P when $\Delta t = 4$

$P(t=4) = P(t=2) + \Delta P$

$\Delta P = \text{slope} * \Delta t$

slope $= r \cdot P = 0.1 \times 122$

$= 12.2$

$\Delta P = 12.2 \times 2 = 24.4$

$P(t=4) = 122 + 24.4$

$= 146.4$

slope $= 0.1 \times 146.4$

$= 14.64$

new slope $= \frac{14.64 + 12.2}{2}$

$= 13.42$

new $\Delta P = 13.42 \times 2$

$= 26.84$

So

$P(t=4) = 122 + 26.84$

$= 148.84$

$P(t=6) = P(t=4) + \Delta P$ $\quad \therefore \Delta P = Slope \times \Delta t$

$Slope = r \cdot P$

$Slope_1 = 0.1(148.84)$

$= 14.88$

$\Delta P = 14.88 \times 2$

$\Delta P = 29.76$

$P(t=6) = 148.84 + 29.76$

$= 178.6$

Again

$Slope = r \cdot P$

$= 0.1(178.6)$

$Slope_2 = 17.86$

Taking avg of both slopes

$Avg = \frac{14.88 + 17.86}{2}$

$= 16.37$ ✗

Ans $\Delta P = Slope \times \Delta t$

$= 16.37 \times 2$

$= 32.74$

$P(t=6) = 148.84 + 32.74$

$= 181.58$