$$P(t+\partial t) = P(t) - 3a \cdot \partial t \cdot P(t) + a \cdot \partial t \cdot (1 - P(t))$$

$$\downarrow$$

$$\frac{P(t+\partial t) - P(t)}{\partial t} = a(1 - P(t) - 3P(t))$$

$$\downarrow$$

$$\frac{\partial P}{\partial t} = a(1 - 4P(t))$$

$$\downarrow$$

$$\frac{\partial P}{(1-4P(t))} = a \cdot \partial t$$

$\downarrow$ — integrate both sides

$$\frac{\ln(1 - 4 \cdot P(t))}{-4} = at + K$$ — constant of integration

$$\downarrow$$

$$\ln(1-4 \cdot P(t)) = -4at + K$$

$\downarrow$ — raise to e.

$$(1-4 \cdot P(t)) = Ce^{-4at}$$

$$\downarrow$$

$$P(t) = \frac{1 - Ce^{-4at}}{4}$$

@ $t=0$, probability of NT not changing $= 1$

So, $1 = \frac{1 - C \cdot 1}{4} \rightarrow C = -3$

- So finally: $P(t) = \boxed{\frac{1}{4} + \frac{3}{4}e^{-4at}.}$

Let $G(t)$ = Probability of NT changing.

Then, $G(t) = 1 - P(t) = \boxed{\frac{3}{4} - \frac{3}{4}e^{-4at}}$