Intro- Population Modeling

Ex: A population of mice inhabit a field. Every month (month = 30 days), every pair of mice produces a single mouse baby. Every day, local owls eats 15 mice.

Ques: what happens to population over time?

$p(t)$ = population of mice at time t in months.

What is the initial population?

1. what if $p(0) = 600$ mice?
2. what if $p(0) = 1000$ mice?

(1)

t	$p(t)$
0	600
1	450
2	225
3	0

300 mice couples

$15 \cdot 30$ per day, days per month

$600 + 300 - 450 = 450$ mice
reproduction, predation

$450 + 225 - 450 = 225$

$225 + 112.5 - 450 = -$ southing!

②

t	$p(t)$
0	1000
1	1050
2	1125
3	1237.5

$1000 \xrightarrow{+50} 1050 \xrightarrow{+75} 1125$

$1000 + 500 - 450 =$

$1050 + 525 - 450 =$

$1125 + 562.5 - 450 =$

To use diffy q's

"change in population = reproduction − predation

P = population

$\frac{dp}{dt}$ = change in population

$$\boxed{\frac{dp}{dt} = p' = 0.5p - 450}$$

$p(t)$

$$\boxed{p' = 0.5p - 450}$$

Describes the function $p(t)$ – in particular, how it changes.

Lets find the unknown function $\boxed{p(t) =}$

$$\frac{p'}{0.5p-450} = \frac{0.5p-450}{0.5p-450}$$

$$\frac{p'}{0.5p-450} = 1$$

$$\boxed{p' = 0.5p - 450}$$

$$p' - 0.5p = -450$$

STEPS TO SOLVE

1. find y_1, a solution to complementary eq.
2. guess $y = u \cdot y_1$,
   $y' =$
3. substitute, solve for u'
   integrate to get u
4. $y = u \cdot y_1$ is answer

I will add solution later