(3)

Mathematics 172

Quiz 1 Name: Key

You must show your work to get full credit.

Let $P(t)$ satisfy

$$P'(t) = .05P(t), \qquad \text{and} \qquad P(0) = 50$$

(1) Give a formula for the value of $P(t)$. $P(t) =$ $50e^{.05t}$

The solution to $P'(t) = aP(t)$ is $P(t) = P(0)e^{at}$. In our case this becomes $P(t) = 50e^{.05t}$

(2) When does $P(t)$ take on the value 800? $t =$ 55.45177

That is we want to solve

$P(t) = 50e^{.05t} = 800$

so $e^{.05t} = 800/50$

$.05t = \ln(800/50)$

$t = \ln(800/50)/.05 = 55.4517$

(3) What is the doubling time of $P(t)$?

Doubling time = 13.8629

We want to solve

$P(t) = 2P(0)$

i.e. $50e^{.05t} = 2 \cdot 50e^{.05t}$

$e^{.05t} = 2$

$.05t = \ln(2)$

$t = \ln(2)/.05 = 13.8629$