

Mathematics 172

Quiz #6

Name: Key

You must show your work to get full credit.

1. Take the derivatives of the following:

(a) $y = 5e^{7t}$

$$\frac{dy}{dx} = \underline{35e^{7t}}$$

(b) $N = N_0e^{-.72t}$, N_0 is constant.

$$N' = \underline{-.72 N_0 e^{-.72t}}$$

(c) $P(t) = P_0e^{rt}$ P_0 and r are constants.

$$\frac{dP}{dt} = \underline{r P_0 e^{rt} = rP}$$

2. Assume that P satisfies the rate equation $P' = .12P$ and that $P(0) = 423$. Then give a formula for $P(t)$.

$$P(t) = \underline{423 e^{.12t}}$$

3. Assume that N satisfies the rate equation $\frac{dN}{dt} = rN$, that $N(0) = 50$ and $N(5) = 75$.

(a) Find r .

$$\begin{aligned} N(t) &= 50 e^{rt} \\ N(5) &= 50 e^{5r} = 75 \\ e^{5r} &= 75/50 \\ 5r &= \ln(75/50) \end{aligned}$$

$$r = \underline{.08110}$$

$$r = \ln(75/50)/5$$

(b) Find a formula for $N(t)$.

$$N(t) = \underline{50 e^{.08110t}}$$

(c) How long until N becomes 10,000?

$$50 e^{.08110t} = 10000 \text{ Time to 10,000 is } \underline{36.94}$$

$$e^{.08110t} = 10000/50$$

$$.08110t = \ln(10000/50)$$

$$t = \ln(10000/50)/.08110 =$$