UNIVERSITI MALAYSIA PERLIS

CENTER FOR DIPLOMA STUDIES

DQT 203 MATHEMATICS 3

ASSIGNMENT

Title	ASSIGNMENT 2

Name	ARVIND A/L ELLANGOPAN		
Matric No	182021255		
Program	R2404	Lecturer	Mrs Haslina

ARVIND A/L ELLANGOPAN

1920212255

ASSIGNMENT 2

DBT 203: MATHEMATICS III

1\. One incident of homicide was happened in a small house at Miami. Police inspector arrived at the crime scene at 1 o'clock in the evening. He found the death body on the floor and immediately measured the temperature of the body. The temperature of the body at that time is 34.5 °C. He then left the body for one hour. After that, he measured the temperature again and the temperature becomes 33.7 °C. Assume that the surrounding temperature is 27 °C and the normal temperature of the body is 37 °C. Find time of death of the body.

$T = T_s + Ae^{-kt}$

$T_0 = 34.5°C$

$T_1 = 33.7°C$

$T_s = 27°C$

$T = 27 + 7.5e^{-0.1128t}$

① At $t = 0$

$34.5 = 27 + Ae^{-k0}$

$34.5 = 27 + A$

$A = 7.5$

② At $t = 1$

$33.7 = 27 + Ae^{-k(1)}$

$33.7 = 27 + 7.5e^{-k}$

$7.5e^{-k} = 6.7$

$e^{-k} = 0.8933$

$\ln e^{-k} = \ln(0.8933)$

$-k = -0.1128$

$k = 0.1128$

③ $37 = 27 + 7.5e^{-0.1128t}$

$7.5e^{-0.1128t} = 10$

$e^{-0.1128t} = 1.333$

$\ln e^{-0.1128t} = \ln 1.333$

$-0.1128t = 0.2874$

$t = -2.55$ hours

-2.55 hours = 2 hours 33 minutes

$\begin{array}{r|l} \cancel{12} & 60 \\ 13 & \cancel{00} \\ -2 & 33 \\ \hline 10 & 27 \text{ a.m} \end{array}$

Time of death of the body = 10.27 a.m

2. A corpse was discovered in a motel at midnight and it temperature at that time was 80° F. The room temperature is 60° F. Two hours later the temperature of the corpse dropped to 75° F. Known the normal body temperature is 98.6° F. Find the time of the corpse death.

$T = T_s + Ae^{-kt}$

$\downarrow$

$T = 60 + 20e^{(-0.1438)(t)}$

$T_0 = 80°F$

$T_2 = 75°F$

$T_s = 60°F$

① At $t = 0$

$80 = 60 + Ae^{-k(0)}$

$80 = 60 + A$

$A = 20$

② At $t = 2$

$75 = 60 + Ae^{-k2}$

$75 = 60 + 20e^{-2k}$

$20e^{-2k} = 15$

$e^{-2k} = 0.75$

$\ln e^{-2k} = \ln 0.75$

$-2k = -0.2877$

$k = 0.1438$

③ $98.6 = 60 + 20e^{-0.1438t}$

$20e^{-0.1438t} = 38.6$

$e^{-0.1438t} = 1.93$

$\ln e^{-0.1438t} = \ln 1.93$

$-0.1438t = 0.6575$

$t = -4.57$ hours

-4.57 hours $= 4$ hours 34 minutes 12 sec

$\begin{array}{rr} \cancel{00}^{23} & \cancel{00}^{60} \\ - \; 4 & 34 \\ \hline 19 & 26 \end{array}$

$= 7.26$ pm #

3. A population growth and decay is given by the equation. $\frac{dP}{dt} = kP(t)$ where $P(t)$ is the population at time t and k is a constant. Show that the general solution to the equation is $P(t) = Ae^{kt}$ where A is a constant.

$$\frac{dP}{dt} = kP(t)$$

$$\int \frac{1}{P(t)}\, dP = \int k\, dt$$

$$\ln|P(t)| = kt + c$$

$$e^{\ln|P(t)|} = e^{kt} \cdot e^{c}$$

$$P(t) = Ae^{kt} \quad ; A = e^{c}$$

4. In 1990, the Department of Natural Resources releases 1000 fish into a lake. In 1997, the population of the fish was estimated to be 3000. By assuming no other factor affect the population, estimate the number of fish in year 2000.

$P(0) = 1000$
$P(7) = 3000$
$P(10) = ?$

① At $t = 0$

$P = Ae^{kt}$
$= 1000e^{kt}$

② At $t = 7$

$P = Ae^{kt}$
$3000 = 1000e^{k7}$
$e^{k7} = 3$
$k7 = \ln 3$
$7k = \ln 3$
$k = \frac{\ln 3}{7}$

$k = 0.1569$

③ At $t = 10$

$P(10) = Ae^{kt}$
$= 1000e^{(0.1569)(10)}$
$= 1000e^{1.569}$
$= 1000(4.802)$
$= 4801.84$
$= 4801$ fishes