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ASSIGNMENT I

Question 1
Define a dynamic equation
Answer
A dynamic equation is an equation [most times a differential equation], that has time "t" as its independent variable. That is the equation of a mathematical model [dynamic system] that varies with time; the equation can be used to make predictions about the system / models future behavior
Examples of dynamic equations are;

1) Radioactive decay

$$\frac{dN}{dt} = -kt$$

[the ds-integration of an element with respect to time]

2) Newtons law of Cooling

$$\frac{dT}{dt} = -k[T - T_A]$$

[the rate of cooling of a system]

3) Velocity

$$\frac{ds}{dt} = V(t)$$

4) Acceleration

$$\frac{dv}{dt} = a(t)$$

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Question 2

$y = Ate^t$ → develop a dynamic model

Solution

$$\frac{dy}{dt} = A[te^t + e^t(1)]$$

$$\frac{dy}{dt} = Ae^t[t+1]$$

from original equation $y = Ate^t$

$$A = \frac{y}{te^t}$$

Substituting we have

$$\frac{dy}{dt} = \frac{y}{te^t} \cdot e^t[t+1]$$

$$\frac{dy}{dt} = \frac{y[t+1]}{t}$$

$$\frac{dy}{dt} = \frac{yt}{t} + \frac{y}{t}$$

$$\frac{dy}{dt} = y + \frac{y}{t}$$

$$t\frac{dy}{dt} = yt + y$$