Método Lineal

$\frac{dy}{dt} + P(t)y = Q(t)$

$\mu(t) = e^{\int P(t)dt}$ $\int Q(t)\mu(t)dt$

$y = \frac{\int Q(t)\mu(t)dt}{\mu(t)} + \frac{C}{\mu(t)}$

Variables Separables

$y' = g(t) \cdot h(y)$

$\int \frac{1}{h(y)} dy = \int g(t)dt$. Despejar y.

Ecuaciones Exactas

$Mdx + Ndy = 0$

$* \frac{\partial f}{\partial x} = M$ $\frac{\partial f}{\partial y} = N$ * 1) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

2) $\int Mdx = f(x) + C(y)$ $\frac{\partial f}{\partial y} = N$ ó $\int Ndy = f(y) + C(x)$ $\frac{\partial f}{\partial x} = M$

3) $f(x,y) = f(x) + C(y)$ ó $f(y) + C(x)$. $C(x)$ se encuentra y *

Factor Integrante

$\frac{M_y - N_x}{N} = h(x)$ ó $\frac{N_x - M_y}{M} = g(y)$ $\int h(x)dx = \int g(y)dy \rightarrow \mu^{\int a}$

$\mu(?)Mdx + \mu(?)Ndy = 0$ (Resolver)

Modelos Matemáticos

Dinamica Poblacional

$\frac{dP}{dt} = KP$ $P(t)$ población en t.

$P(t) = P_0 e^{Kt}$. Hallar P_0 y K despejando.

Decaimiento Radioactivo

$\frac{dA}{dt} = KA$ $A(t)$ sustancia que queda.

$P(t) = P_0 e^{Kt}$ Vida Media $A(t) = \frac{1}{2}A_0$ $\frac{1}{2} = e^{Kt}$ $t = \frac{\ln(0.5)}{K}$

Ley de Enfriamiento

$\frac{dT}{dt} = K(T - T_m)$ $T(t)$ = temperatura en t. dT/dt rapidez cambio, T_m es la temperatura ambiente

$T(t) = T_m + Ce^{Kt}$ C y K

Mezclas

$\frac{dA}{dt} = \text{Razon Entra}\left[\frac{m_a}{t}\right] - \text{Razón Sale}\left[\frac{m_a}{t}\right]$

Cantidad sal $[m_a]$

Si $\text{vel}_{\text{entra}} = \text{vel}_{\text{salida}}$ $\frac{dA}{dt} = \text{Vel Entra}\left[\frac{V_0}{t}\right] \cdot \text{Concen Entra}\left[\frac{m_a}{V}\right] - \text{Vel Sali}\left[\frac{V_0}{t}\right] \cdot \frac{A}{\text{Cap. Tanque}[V_0]} \rightarrow \frac{\partial A}{\partial t} + P(t)A = Q(t)$

Si $\text{vel}_{\text{entra}} \neq \text{vel}_{\text{sale}}$ $\frac{dA}{dt} = \text{Vel Entra}\left[\frac{V_0}{t}\right] \cdot \text{Concen Entra}\left[\frac{m_a}{V}\right] - \text{Vel Sali}\left[\frac{V_0}{t}\right] \cdot \frac{A}{\text{Cap. Tanque}[V_0] + (\text{Vel}_{\text{entra}} - \text{Vel}_{\text{sale}})t}$