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 Civil Engineering
 Mat Engg 310118

a) mathematical modelling is the process of setting up a model, solving it mathematically, and interpreting the result in physical or other terms.

b) Differentiation

c) Balance law

c) $T(0) = 10^\circ\text{C}$
 $T(1) = 20^\circ\text{C}$
 $T_{\text{amb}} = 25^\circ\text{C}$
 $\frac{dT}{dt} = k(T - T_a)$

$$dT = k dt$$

$$\int_{T_1}^{T_2} \frac{dT}{(T - T_a)} = \int k dt$$

$$\ln(T - T_a) = kt + C$$

$$T - T_a = P^{kt} \cdot e^C$$

$$A = e^C$$

$$T_1 - T_a = AP^{k_1} + T_a$$

$$T = AP^{kt} + T_a$$

$$\text{when } T(0) = 10$$

$$10 = AP^{k(0)} + 25$$

$$10 = A(1) + 25$$

$$10 - 25 = A$$

$$A = -15$$

$$A = -15$$

$$T(t) = 25 - 15P^{kt}$$

$$\text{At } T(5) = 20$$

$$I_0 = 25 - 15P^{5k}$$

$$20 - 25 = -15P^{5k}$$

$$15P^{5k} = 25 - 10$$

$$15P^{5k} = 15$$

$$P^{5k} = 1/5$$

$$5k = \ln(1/5)$$

$$5k = -1.0986$$

$$k = \frac{-1.0986}{5}$$

$$5$$

$$k = -0.21992$$

$$T(t) = 25 - 15P^{-0.21992t}$$