Lec04   Substitutions

① Scaling :- Simple mean's change the co-ordinates in effect to change the axes to scale the axis to either streatch or contract

<u>Scaling</u>: $x_1 = \dfrac{x}{a}$ $y_1 = \dfrac{y}{b}$

a, b are Constant's

① Change units

② make variable's dimentionless

③ reduce # constant's in eqn

$$\frac{dT}{dt} = k\left(M^4 - T^4\right)$$

$T =$ initial temp

$M =$ Constant, External temp

$$T_1 = \frac{T}{M}$$

Direct substitution:

$$\text{New variable} = \boxed{\text{Old variable}}$$

indirect method:

$$\text{Old variab} = \boxed{\text{New variab}}$$

Bernoulli

$$\frac{y'}{y^n} = P(x) \frac{1}{y^{n-1}} + q(x)$$

take $\quad v = \frac{1}{y^{n-1}}$

$$dv = (1-n) \frac{1}{y^n} y'$$

$$\frac{v'}{1-n} = P(x) v + q(x) \qquad (\text{Linear})$$

<u>Homogenous ODE's</u>

$$y' = F(y/x)$$

Invariant under zoom

$$x \to ax \quad , \quad y \to ay$$

<u>Substitution:</u>

$$z = \frac{y}{x} \implies y = zx$$

$$y' = z'x + z$$

$$\implies z'x + z = F(z)$$