Work done by variable force

`W = int dW = int\_0^s F\*dx`

Work done by the force is given by area under force-displacement graph

Work energy theorem

The work done by the net force acting on an object is equal to the change in the kinetic energy of that object

W = change in kinetic energy

`P = w/t` t = timetaken to do work w = work done p =power

` P = Fv`

1hp = 746 W

Mean power `= w/t = (DeltaK.E)/t`

Circular motion

Angular velocity(`omega`)

Omega = (deltatheta)/(delta t)

Linear velocity `V= (ds)/(dt)`

`V = romega`

Angular acceleration(`alpha`) = `(domega)/(dt)`

Linear acceleration along circle

Tangential acceleration (`a\_{t}`) = `(d|v|)/(dt)`

It is the component of acceleration responsible for linear speed

Speed = constant `a\_{t} = 0 `

The component of linear acceleration towards centre or in radial direction is called centripetal acceleration it is responsible for change in direction of linear velocity

`a\_{r} = v^2/r = r omega^2`

these two components are mutually perpendicular so net linear acceleration is vector sum

`a= sqrt(a\_{t}^2 +a\_{r}^2)`

`tantheta = a\_{r}/a\_{t}`

`Omega = (dtheta)/(dt)`

`a = v (dv)/(dt)`

`alpha = omega (domega)/(dt)`

`v = romega`

`a = ralpha`

Radius of curvature of the instantaneous circle

`R = ([1 + ((dy)/(dx))^2])^(3/2)/abs((d^2y)/(dx^2))`

Centripetal force

`F = (mv^2)/r`

Centripetal force does no work

Centrifugal force

(it is like pseudo force in laws of motion) imagine going in a car turning along curve we move towords a side due to this force .it is applicable only for non-inertial frame of reference.

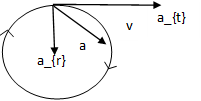
`F = (dU)/(dx)`

Sate of equilibrium : `(dU)/(dx) = 0`

three types of circular motion

1. Uniform circular motion v and omega are constant so `a= a{r}`
2. Accelerated circular motion v and omega increasing so, `a\_{t}` is in direction of v and alpha in direction of `omega`

&image&



`a=sqrt(a\_{t}^2 + a\_{r}^2) `

1. Retarding circular motion `v` and `omega` decreasing `a\_{t}` is in the opposite direction of `v` and `alpha` is in opposite of `omega`

`omega` is perpendicular paper inward , `alpha` is perpendicular to paper outward in circular motion, if `alpha = constant`

`omega = omega\_{0} + alphat`

`omega^2 – omega\_{0}^2 = 2alphatheta`

`theta = omega\_{0}t +1/2 alphat^2`

For remembering – `omega =v`, `omega\_{0} = u`

If `alpha` not equal to constant

`Omega = (dtheta)/(dt)` `alpha = (domega)/(dt)`

On any curve path `a = sqrt(a\_{t}^2 + a\_{r}^2)`

`omega = r\_{bot} \*v`

`alpha = r\_{bot} \* a`

Sum of moments about C = 0

&image&

C

A

B

F

F

(CB)F + (CA)F = 0

Friction and banking

`V = sqrt(rg tantheta) = sqrt(murg)` `mu = tantheta`

If vehicle at rest friction is upward

If `v > sqrt(rg tantheta)` friction is downward

If `v < sqrt(rg tantheta)` friction is upward

If `v = sqrt(rg tantheta)` friction = 0

Vertical circle