

PHYS 211X

General Physics I

Formulas

Position:

$$x, y, s, \text{ or } p = \vec{v}\Delta t = \int \vec{v}dt \quad (1)$$

$$x = \left(\frac{v_0 + v_f}{2}\right)\Delta t \quad (2)$$

$$x = v_0t + \left(\frac{1}{2}\right)\vec{a}t^2 \quad (3)$$

$$(4)$$

Velocity:

$$\vec{v} = \vec{a}\Delta t = \frac{d}{dt}[p] = \int (\vec{a})dt \quad (5)$$

$$\vec{v} = v_0 + \vec{a}t \quad (6)$$

$$\vec{v}_f^2 = v_0^2 + 2\vec{a}\Delta x \quad (7)$$

$$(8)$$

Acceleration

$$\vec{a} = \frac{d}{dt}[\vec{v}] \quad (9)$$

Projectile Motion:

$$y_f = y_0 + v_0(\Delta t) + \frac{1}{2}a(\Delta t^2) \quad (10)$$

Force:

$$\vec{F} = m\vec{a} \quad (11)$$

Friction:

$$f = \mu N \quad (12)$$

Drag:

$$\vec{F}_D \text{ or } D = \frac{1}{2}\rho C_D A v^2 \quad (13)$$

Circular Motion:

$$\vec{v} = r \quad (14)$$

$$a_{cent} = \frac{\vec{v}^2}{r} \quad (15)$$

$$f = \mu n \quad (16)$$

$$v_{cent} = \sqrt{gr} \quad (17)$$

$$N = mr\omega^2 \quad (18)$$

$$N = 3mg \quad (19)$$

$$\omega = \frac{\Delta\theta}{\Delta t} \quad (20)$$

$$(21)$$

Total Energy:

$$E = K + U_0 \quad (22)$$

PE of a spring:

$$U_p = \frac{1}{2}k(-L_0)^2 \quad (23)$$

Total Potential Energy:

$$U_{tot} = mg + k(y - L_0) \quad (24)$$

ork:

$$W_{int} = -\frac{F}{\Delta} \quad (25)$$

$$F = -\frac{dU}{d} \quad (26)$$

Key

v = velocity, meters/second

y = height, meters

x = distance, meters

t = time, seconds

m = mass, kilograms

a = acceleration, meters/second²

θ = angle, degrees

g = gravity: 9.8 meters/second²

ω = angular velocity, radians or degrees/second, counter-clockwise

F = force, Newtons, kilogram \cdot meters/second²

μ = coefficient of friction

N = normal force, Newtons

A = area, meters²

ρ = volumetric mass density, kilograms/meters³

C_D = drag coefficient (geometry dependant)

K = kinetic energy

U = potential energy