CUSD Semester 1 Physics Common Final Equation Sheet

Distance (units: m) – How much ground an object has covered during its motion

Displacement (units: m) – the difference between an object's final and initial position

$$\Delta x = x_f - x_i$$

Ave velocity = Change in position divided by change in time.

$V = \Delta x / \Delta t$ or Constant velocity (units: m/s) – constant displacements over constant changes in time

rearranged to find displacement $\Delta x = v\,(\Delta t)$

Constant Acceleration (units: m/s^2) – constant change in an object's velocity over constant changes in time. Acceleration includes slowing down, speeding up and changing direction.

Ave. acceleration = Change in velocity divided by change in time

$a = \Delta v / \Delta t$ or rearranged to find final velocity $v_f = a(\Delta t) + v_i$

Equations of motion for objects experiencing constant Acceleration:

$$\Delta y = (1/2)a(\Delta t)^2 + v_{yi}\,(\Delta t)$$

$$v_{yf}{}^2 = v_{yi}{}^2 + 2a(\Delta y)$$

Newton's Laws of Motion:

Horizontal direction: $F_{net\,x}$ = sum of all forces acting to the right – sum of all forces acting to the left

Vertical direction: $F_{net\,y}$ = sum of all forces acting upward – sum of all forces acting downward

1st Law: Balanced Forces cause constant motion

$F_{net} = 0$ N,

2nd Law: Unbalanced (Net) forces cause acceleration

$F_{net} = ma$

3rd Law: Interacting objects simultaneously exert forces upon each other that are equal in size and opposite in direction

$F_{1/2} = - F_{2/1}$

Force of gravity experienced by a mass on the surface of the Earth can be calculated using the following:

$F_g = mg$, where g= 9.8 N/kg as well as g=9.8 m/s^2

Uniform Centripetal Motion

$F_{net\ in} = F_c$ = sum of all forces acting inward – sum of all forces acting outward

V_{Tan} = Circumference/ Period = $2\pi r/T$, where r is the radius of the circular path and T is the time taken to complete one cycle

$a_c = v_{Tan}^{\ 2} / r$

$F_c = ma_c = m(v_{Tan}^{\ 2} / r)$