Physics 12 Graphical Analysis of Motion
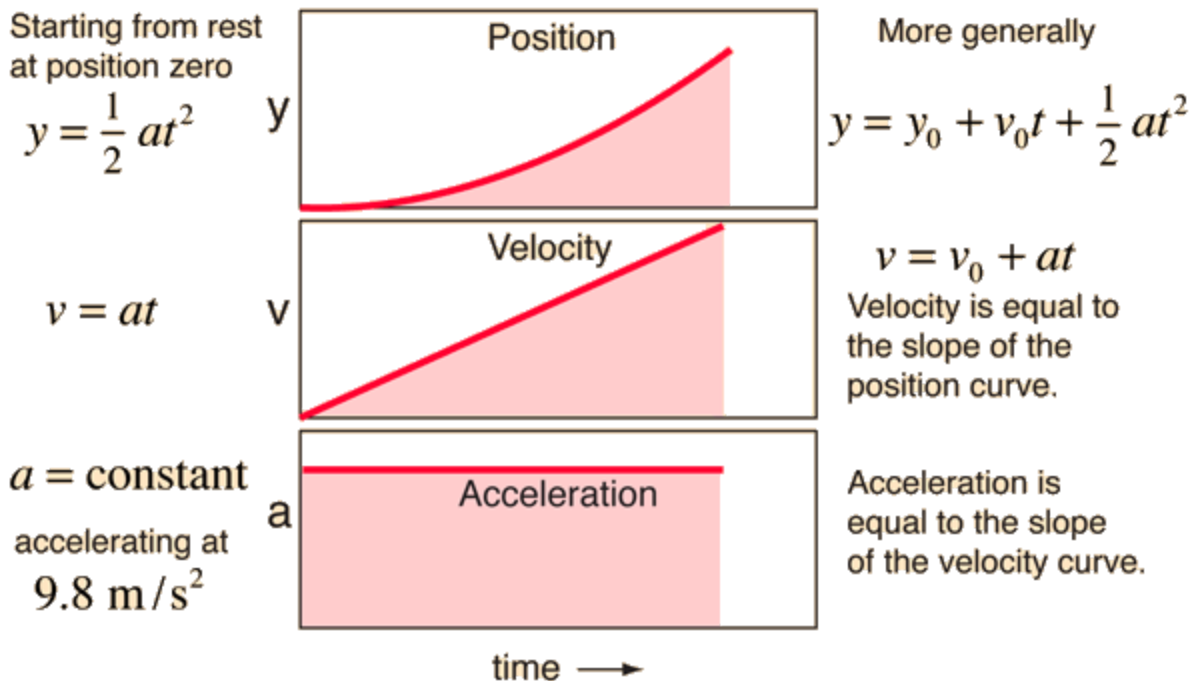
1. The four equations for constant acceleration can be determined from several graphs and some derivations.

$v = v_o + at$ (the equation of the line from a velocity versus time graph)

$v_{av} = \Delta d \times t$ (comes from the equation of the line for a displacement versus time graph)

$d = v_o t + 1/2 at^2$ (comes from the equations of the line from a displacement versus time graph)

$v^2 = v_o^2 + 2ad$ (comes from a derivation shown in a previous lesson)

Starting from rest at position zero

$y = \dfrac{1}{2} at^2$

$v = at$

$a = \text{constant}$

accelerating at $9.8 \ \text{m/s}^2$

Position

Velocity

Acceleration

time →

More generally

$y = y_0 + v_0 t + \dfrac{1}{2} at^2$

$v = v_0 + at$
Velocity is equal to the slope of the position curve.

Acceleration is equal to the slope of the velocity curve.

2. The above middle graph also can be used to determine the displacement by taking the area under the velocity versus time graph.