***Fundamental Equations***

***Why does it matter?*** These motion equations tell you about the future based on past events.

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| **What Does It Tell You?** | **Equation** | **What Do You Need To Use It?** | **Condition** |
| Final Velocity | *v*f *= v0 + at* | Initial Velocity (m/s)  Acceleration (m/s2)  Time (s) | Displacement is Unknown |
| Final Velocity | vf2 = v02 + 2a(x-x0) | Initial Velocity (m/s)  Acceleration (m/s2)  Displacement (m) | Time is Unknown |
| Average Velocity | v = (½)(v2 + v0)  v=(xf-x0)/(tf-t0) | Initial Velocity (m/s)  Final Velocity (m/s) | Constant Acceleration |
| Final Position | xf = x0 + v0t + (½)at2 | Initial Velocity (m/s)  Initial Position (m)  Acceleration (m/s2)  Time (s) | N/A |
| Final Position | xf = x0 + vt | Average Velocity (m/s)  Initial Position (m)  Change in Time (s) | Constant Acceleration |
| Force | (net)F = ma  F=m(0)=0 | Mass  Acceleration | If constant velocity then acceleration is zero |
| Friction Force | *f* = ukFn  Fn=mg  Mg= weight of mass | Friction Coefficient  Normal Force | Weight is a force calculated by the force of gravity done on the mass. |