

# Astronomy 25

## Newtonian Equations

### Key definitions

$$v = \Delta x / \Delta t$$

(Linear velocity)

$$v = v_1 + v_2$$

(Newtonian velocity addition)

$$a = \Delta v / \Delta t$$

(Linear acceleration)

### Newton's Basics

$$F = ma$$
$$m_1 a_1 = m_2 a_2$$

(Newton's Laws 2, 3)

$$F = GM_1 M_2 / R^2$$

(Newton's Law of Gravity)

### Energy

$$E = \frac{1}{2} m v^2$$

(Kinetic energy)

$$E = mgh$$

(Potential energy in a uniform gravitational field)

### Motions

$$\Delta x = \frac{1}{2} a \Delta t^2$$

(Displacement from an acceleration)

$$R = (v^2 / g) \sin 2\theta$$

(Range of a missile)

$$F = m v^2 / R$$

(Force needed to keep an object in a circular path.)