The Equations

1-D Kinematics → Conservation of Energy

$$\Delta x = x - x_0$$

$$\overline{v} = \frac{x - x_0}{t}$$

$$a = \frac{v - v_0}{t}$$

$$\overline{v} = \frac{v_0 + v}{2}$$

$$v = v_0 + at$$

$$\Delta x = vt - \tfrac{1}{2}at^2$$

$$\Delta x = v_0 t + \tfrac{1}{2}at^2$$

$$\Delta x = \tfrac{1}{2}(v + v_0)t$$

$$v^2 = v_0^2 + 2a\Delta x$$

$$\Delta x = v_{0x} t$$

$$v_y = v_{0y} - gt$$

$$\Delta y = v_{0y} t - \tfrac{1}{2}gt^2$$

$$v_y{}^2 = v_{0y}^2 - 2g\Delta y$$

$$\Delta y = v_y t + \tfrac{1}{2}gt^2$$

$$y = \tan\theta x - \frac{g}{2v_0^2 \cos^2\theta} x^2$$

$$\Sigma F = ma$$

$$G = mg$$

$$f = \mu_{s,k} N$$

$$F = -G\frac{m_1 m_2}{r^2}$$

$$a_R = \frac{v^2}{r}$$

$$ma_R = m\frac{v^2}{r}$$

$$f = \frac{1}{\tau}$$

$$v = \frac{2\pi r}{\tau}$$

$$v = 2\pi r f$$

$$F = k\frac{q_1 q_2}{r^2}$$

$$P = \frac{F}{A}$$

$$W = Fd\cos\phi$$

$$W = -\Delta U$$

$$F_s = -kx$$

$$P_{avg} = \frac{W}{\Delta t} = F\overline{v}$$

$$W = \Delta K$$

$$K = \tfrac{1}{2}mv^2$$

$$U_G = mgh$$

$$U_S = \tfrac{1}{2}kx^2$$

$$\Sigma E_0 = \Sigma E_1 \qquad K_0 + U_{S0} + U_{G0} = K_1 + U_{S1} + U_{G1} \qquad W_{NC} = \Delta K + \Delta U$$

The Constants

1-D Kinematics → Conservation of Energy

$$g_{Earth's\ Surface} = 9.802\ \text{m/s}^2$$

$$m_{Earth} = 5.98 \times 10^{24}\ \text{kg} \qquad r_{Earth} = 6.38 \times 10^{6}\ \text{m} \qquad d_{Earth-Moon} = 3.84 \times 10^{8}\ \text{m}$$

$$m_{Moon} = 7.35 \times 10^{22}\ \text{kg} \qquad r_{Moon} = 1.74 \times 10^{6}\ \text{m} \qquad d_{Earth-Sun} = 1.496 \times 10^{11}\ \text{m}$$

$$m_{Sun} = 1.99 \times 10^{30}\ \text{kg} \qquad r_{Sun} = 6.96 \times 10^{8}\ \text{m} \qquad G = 6.67 \times 10^{-11}\ \frac{N \cdot m^2}{kg^2}$$

$$k = 8.988 \times 10^{9}\ \frac{N \cdot m^2}{C^2}$$