Physics 101 Formula Sheet

Constant acceleration (2-12): $x = x_0 + v_0 t + \frac{1}{2} a t^2$, $v = v_0 + at$, $v^2 = {v_0}^2 + 2a(x - x_0)$

Vector components (3-2, 3-3): $V_x = V\cos\theta$; $V_y = V\sin\theta$

$$V = \sqrt{V_x^2 + V_y^2}; \qquad \tan\theta = \frac{V_y}{V_x}$$

Relative velocity (3-15): $\vec{v}_{BS} = \vec{v}_{BW} + \vec{v}_{WS}$

Circular motion (5-1): $a_c = \frac{v^2}{r}$, $v = \frac{2\pi r}{T}$, $T = \frac{1}{f}$

Newton's law of gravitation (6-1): $F = G\frac{m_1 m_2}{r^2}$; where $G = 6.67 \times 10^{-11} N \cdot m^2 / kg^2$

Dot (or scalar) product of two vectors (7-2, 7-4): $\vec{A} \cdot \vec{B} = AB\cos(\theta) = A_x B_x + A_y B_y + A_z B_z$

Work (7-3): $W = \vec{F} \cdot \vec{d} = Fd\cos(\theta)$

Kinetic Energy (7-10): $K = \frac{1}{2} m v^2$

Work energy principle (7-11): $W_{net} = \Delta K = \frac{1}{2} m v_2^2 - \frac{1}{2} m v_1^2$

Potential Energy:

Gravity (universal) (8-17): $U(r) = -\frac{GmM}{r}$

Gravity (near surface of the earth) (8-3): $U = mgy$

Spring (8-5) $U = \frac{1}{2} k x^2$

Power (8-21): $P = \frac{W}{\Delta t} = \vec{F} \cdot \vec{v}$