

## Physics 101 Formula Sheet (for Midterm #1)

**Constant acceleration (2-11):**  $x = x_0 + v_0 t + \frac{1}{2} a t^2$  ,  $v = v_0 + a t$  ,  $v^2 = v_0^2 + 2a(x - x_0)$

**Vector components (3-3, 3-4):**  $V_x = V \cos \theta$ ;  $V_y = V \sin \theta$   
 $V = \sqrt{V_x^2 + V_y^2}$ ;  $\tan \theta = \frac{V_y}{V_x}$

**Relative velocity (3-6):**  $\vec{v}_{BS} = \vec{v}_{BW} + \vec{v}_{WS}$

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

**Newton's law of gravitation (5-4):**  $F = G \frac{m_1 m_2}{r^2}$ ; where  $G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2 / \text{kg}^2$

**Work (6-1):**  $W = \vec{F} \cdot \vec{d} = Fd \cos(\theta)$

**Kinetic Energy (6-3):**  $K = \frac{1}{2} m v^2$

**Work energy principle (6-2, 6-4):**  $W_{net} = \Delta K = \frac{1}{2} m v_2^2 - \frac{1}{2} m v_1^2$

**Potential Energy:** Gravity (near surface of the earth) (6-6):  $PE_{grav} = mgy$

Spring (6-9)  $U = \frac{1}{2} kx^2$

**Power (6-17):**  $P = \frac{W}{\Delta t} = \vec{F} \cdot \vec{v}$

**Momentum (7-1):**  $\vec{p} = m\vec{v}$

**Centre of mass (7-9):**  $\vec{r}_{CM} = \frac{\sum m_i \vec{r}_i}{M}$

**Sine and Cosine Laws:**  $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

$$c^2 = a^2 + b^2 - 2ab \cos C$$