PHYS-201 Equation Sheet for Midterm Exam #1
(22 October 2010, STRATTON 113, 8:00-8:50 am)

Chapter 1: Units, Physical Quantities, and Vectors

$$1 \text{ kilometer} = 1 \text{ km} = 10^3 \text{ m} \qquad 1 \text{ decimeter} = 1 \text{ dm} = 10^{-1} \text{ m}$$

$$1 \text{ centimeter} = 1 \text{ cm} = 10^{-2} \text{ m} \qquad 1 \text{ millimeter} = 1 \text{ mm} = 10^{-3} \text{ m}$$

$$1 \text{ micrometer} = 1\ \mu\text{m} = 10^{-6} \text{ m} \qquad 1 \text{ nanometer} = 1 \text{ nm} = 10^{-9} \text{ m}$$

$$1 \text{ gram} = 1 \text{ g} = 10^{-3} \text{ kg} \qquad 1 \text{ milligram} = 1 \text{ mg} = 10^{-3} \text{ g}$$

$$1 \text{ microgram} = 1\ \mu\text{g} = 10^{-6} \text{ g} \qquad 1 \text{ millisecond} = 1 \text{ ms} = 10^{-3} \text{ s}$$

$$1 \text{ microsecond} = 1\ \mu\text{s} = 10^{-6} \text{ s} \qquad 1 \text{ nanosecond} = 1 \text{ ns} = 10^{-9} \text{ s}$$

$$\vec{\mathbf{A}} + \vec{\mathbf{B}} = \vec{\mathbf{B}} + \vec{\mathbf{A}} \qquad (\vec{\mathbf{A}} + \vec{\mathbf{B}}) + \vec{\mathbf{C}} = \vec{\mathbf{A}} + (\vec{\mathbf{B}} + \vec{\mathbf{C}})$$

$$\vec{\mathbf{A}} - \vec{\mathbf{B}} = \vec{\mathbf{A}} + (-\vec{\mathbf{B}}) \qquad \vec{\mathbf{A}} = \vec{\mathbf{A}}_{\mathbf{x}} + \vec{\mathbf{A}}_{\mathbf{y}}$$

$$A_x = A\cos\theta \qquad A_y = A\sin\theta$$

$$A = \sqrt{A_x^2 + A_y^2} \qquad \theta = arctan\frac{A_y}{A_x}$$

$$\vec{\mathbf{B}} = c\vec{\mathbf{A}} \qquad \vec{\mathbf{B}} = (B_x, B_y) = (cA_x, cA_y)$$

$$\vec{\mathbf{R}} = \vec{\mathbf{A}} + \vec{\mathbf{B}} = (A_x + B_x, A_y + B_y) \qquad R = \sqrt{(A_x + B_x)^2 + (A_y + B_y)^2}$$

$$\vec{\mathbf{A}} = A_x\hat{\mathbf{i}} + A_y\hat{\mathbf{j}} + A_z\hat{\mathbf{k}} \qquad \vec{\mathbf{B}} = B_x\hat{\mathbf{i}} + B_y\hat{\mathbf{j}} + B_z\hat{\mathbf{k}}$$

$$\vec{\mathbf{R}} = \vec{\mathbf{A}} + \vec{\mathbf{B}} = R_x\hat{\mathbf{i}} + R_y\hat{\mathbf{j}} + R_z\hat{\mathbf{k}} \qquad R_x = A_x + B_x$$

$$R_y = A_y + B_y \qquad R_z = A_z + B_z$$

Chapter 2: Motion Along a Straight Line

$$v_{av-x} == \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t} \qquad v_x = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

$$a_{av-x} == \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t} \qquad a_x = \lim_{\Delta t \to 0} \frac{\Delta v_x}{\Delta t} = \frac{dv_x}{dt}$$

$$v_x = v_{0x} + a_x t\ [const.a_x] \qquad x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2\ [const.a_x]$$

$$v_x^2 = v_{0x}^2 + 2a_x(x - x_0)\ [const.a_x] \qquad x - x_0 = \left(\frac{v_{0x} + v_x}{2}\right) t\ [const.a_x]$$

Chapter 4: Newton's Laws of Motion

$$\vec{\mathbf{R}} = \vec{\mathbf{F_1}} + \vec{\mathbf{F_2}} + ... = \sum \vec{\mathbf{F}} \qquad R_x = \sum F_x \quad \& \quad R_y = \sum F_y$$

$$\sum \vec{\mathbf{F}} = 0 \qquad \sum F_x = 0 \quad \& \quad \sum F_y = 0$$

$$\sum \vec{\mathbf{F}} = m\vec{\mathbf{a}} \qquad \sum F_x = ma_x \quad \& \quad \sum F_y = ma_y$$

$$\vec{\mathbf{F}}_{A\,on\,B} = -\vec{\mathbf{F}}_{B\,on\,A} \qquad \vec{\mathbf{w}} = m\vec{\mathbf{g}} \quad \& \quad g = 9.8 \text{ m/s}^2$$