UNIVERSITY OF MANITOBA

October 13, 2011 (7:00 PM - 9:00 PM)	FINAL EXAMINATION Formula Sheet
COURSE NO: PHYS 1050	TIME: 2 hours
EXAMINATION: Physics 1: Mechanics	EXAMINERS: C-M. Hu, F. Lin, S. Page

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Mathematics

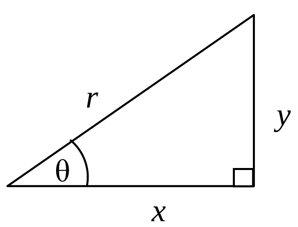
Quadratic equation:

$$ax_2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Trigonometry

$$x^2 + y^2 = r^2$$



$$\sin\theta = y / r$$
$$\cos\theta = x/r$$
$$\tan\theta = y/x$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

Calculus:

$$\frac{d}{dt}(a \cdot t^n) = a \cdot nt^{n-1}$$

$$\int x^n dx = \frac{x^{n+1}}{n+1}$$

Constants and Units

k = 10^3, μ = 10^{-6}, n = 10^{-9}

$c = 3.0\times10^8$ m/s
$g = 9.80$ m/s^2

Translational Kinematics

Three dimensions:

$$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$$

$$\vec{v}_{av} = \frac{\Delta\vec{r}}{\Delta t} = \frac{\vec{r}_2 - \vec{r}_1}{t_2 - t_1} \qquad v = \lim_{\Delta t\to 0}\frac{\Delta\vec{r}}{\Delta t} = \frac{d\vec{r}}{dt}$$

$$\vec{a}_{av} = \frac{\Delta\vec{v}}{\Delta t} = \frac{\vec{v}_2 - \vec{v}_1}{t_2 - t_1} \qquad \vec{a} = \lim_{\Delta t\to 0}\frac{\Delta\vec{r}}{\Delta t} = \frac{d\vec{v}}{dt}$$

One dimension:

$$v_{x,av} = \frac{\Delta x}{\Delta t} \qquad v_x = \lim_{\Delta t\to 0}\frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

$$a_{x,av} = \frac{\Delta v_x}{\Delta t} \qquad a_x = \lim_{\Delta t\to 0}\frac{\Delta v_x}{\Delta t} = \frac{dv_x}{dt}$$

Constant acceleration in one dimension:

$$x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2$$

$$v_x = v_{0x} + a_x t$$

$$v^2_x = v^2_{0x} + 2a_x(x - x_0)$$

Uniform circular motion:

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

Particle Dynamics

$$\Sigma\vec{F} = m\vec{a} \qquad W = mg$$

$$\left.\begin{aligned} f_s &\le \mu_s N \\ f_k &= \mu_k N \end{aligned}\right\} \quad N = \text{normal force}$$

Relative Motion

$\vec{v}_{PA} = \vec{v}_{PB} + \vec{v}_{BA}$ (*PA* means *P* relative to *A*, etc.)