

**PHYS 124, LEC 01 : Particles and Waves**  
**Instructor : Marc de Montigny**  
**Formula Sheet : Mid-Term Examination, October 24, 2007**

Name : \_\_\_\_\_

Student ID: \_\_\_\_\_

You can add your own formulas on this side only. You will lose 5 marks (out of 20) if:

1. full solutions are included;
2. this sheet is not returned with your exam, or
3. you have written formulas on both sides. Use this side only.

$$\cos \theta = \frac{x}{h} \quad \sin \theta = \frac{y}{h} \quad \tan \theta = \frac{y}{x} \quad h^2 = x^2 + y^2$$

$$ax^2 + bx + c = 0 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \vec{v}_{13} = \vec{v}_{12} + \vec{v}_{23}$$

$$\Delta x = x_f - x_i \quad v_{av} = \frac{\Delta x}{\Delta t} \quad v = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} \quad a = \lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t}$$

$$\begin{aligned} v_x &= v_{0x} + a_x t & v_y &= v_{0y} + a_y t \\ x &= x_0 + v_{0x} t + \frac{1}{2} a_x t^2 & y &= y_0 + v_{0y} t + \frac{1}{2} a_y t^2 \\ x &= x_0 + \frac{1}{2} (v_{0x} + v_x) t & y &= y_0 + \frac{1}{2} (v_{0y} + v_y) t \\ v_x^2 &= v_{0x}^2 + 2a_x(x - x_0) & v_y^2 &= v_{0y}^2 + 2a_y(y - y_0) \end{aligned}$$

$$\sum \vec{F} = m\vec{a} \quad \sum F_x = ma_x \quad \sum F_y = ma_y \quad \vec{F}_{AB} = -\vec{F}_{BA}$$

$$\vec{W} = m\vec{g} \quad \vec{a}_{grav} = (a_x, a_y) = (0, -g) \quad g = 9.81 \text{ m/s}^2$$

$$\begin{aligned} F_x &= -kx & f_k &= \mu_k N & f_s &\leq f_{s,max} = \mu_s N & a_{cp} &= \frac{v^2}{r} & v &= \frac{2\pi r}{T} \\ W &= Fd \cos \theta & K &= \frac{1}{2} mv^2 & W_{total} &= \Delta K = K_f - K_i & P &= \frac{W}{t} = Fv \end{aligned}$$

$$\begin{aligned} \Delta U &= U_f - U_i = -W_c & U &= mgy & U &= \frac{1}{2} kx^2 \\ E &= K + U & E_f &= E_i + W_{nc} & \Delta K + \Delta U &= W_{nc} \end{aligned}$$