Physics 131 – Midterm Equation Sheet

1-D Kinematics

$v_x = dx/dt$ $\quad a_x = dv_x/dt$ $\quad x_f = x_i + \int_{t_i}^{t_f} v_x(t)\,dt$ $\quad v_{xf} = v_{xi} + \int_{t_i}^{t_f} a_x(t)\,dt$

$v_{x,ave} = \Delta x/\Delta t$ $\quad a_{x,ave} = \Delta v_x/\Delta t$

$v = v_o + a\,t$
$x = v_o t + \frac{1}{2} a\,t^2$
$v^2 - v_o^2 = 2a\,(x - x_o)$
$x - x_o = \frac{1}{2}(v + v_o)\,t$

Circular Motion

$a = v^2/r$
$T = 2\pi r/v$

Vector Kinematics

$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ $\quad \vec{v} = v_x\hat{i} + v_y\hat{j} + v_z\hat{k}$ $\quad \vec{a} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$

$\vec{v} = d\vec{r}/dt$ $\quad \vec{a} = d\vec{v}/dt$

Dynamics

$\vec{F}_{net} = m\,\vec{a}$ $\quad \vec{F}_{1\,2} = -\vec{F}_{2\,1}$

Particular Forces

$F = G\dfrac{m_1 m_2}{r^2}$ $\quad W = mg$

$f_{s,max} = \mu_s N$ $\quad f_k = \mu_k N$

Constants

$G = 6.67 \times 10^{-11}\ Nm^2/kg^2$
$g = 9.80\ m/s^2$