Formula Sheet for Exam 1
PHYS 1110 Section 02

1 in = 2.54 cm | 1 ft = 12 in | 1 m = 39.37 in = 3.28 ft
1 mi = 1,609 m | 1 h = 3,600 s | 1 year = 365 days

$\vec{v}_{\text{avg}} = \Delta\vec{r}/\Delta t$ $\quad \vec{v} = \lim_{\Delta t \to 0} \Delta\vec{r}/\Delta t$

$\vec{a}_{\text{avg}} = \Delta\vec{v}/\Delta t$ $\quad \vec{v} = \lim_{\Delta t \to 0} \Delta\vec{v}/\Delta t$

Constant acceleration in one dimension:

$v = v_0 + at$ $\quad x = x_0 + v_0 t + \frac{1}{2}at^2$

$x - x_0 = \frac{1}{2}(v_0 + v)t$ $\quad v^2 - v_0^2 = 2a(x - x_0)$

Ballistic trajectories:

$v_{0x} = v_0 \cos\theta$ $\quad v_{0y} = v_0 \sin\theta$

$a_x = 0$ $\quad a_y = -g$

$v_x = v_{0x}$ $\quad v_y = v_{0y} - gt$

$x = x_0 + v_{0x}t$ $\quad y = y_0 + v_{0y}t - \frac{1}{2}gt^2$

$v_y^2 - v_{0y}^2 = -2g(y - y_0)$

Range equation $R = \frac{v_0^2}{g}\sin(2\theta)$

Quadratic formula: when $0 = ax^2 + bx + c$, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

g = 9.8 m/s^2 $\quad F_g = mg$ $\quad f_s \leq \mu_s N$ $\quad f_k = \mu_k N$

Cartesian and polar coordinates:

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

$y = r\sin\theta$ $\quad r^2 = x^2 + y^2$

Newton's laws of motion:

$(\Sigma\vec{F} = \vec{0}) \Leftrightarrow (\vec{a} = \vec{0})$ $\quad \vec{a} = \Sigma\vec{F}/m$ $\quad \vec{F}_{A\to B} = -\vec{F}_{B\to A}$