Formula Sheet for Exam 2
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
1 mi = 5,280 ft	g = 9.8 m/s^2	G = 6.67×10^{-11} N·m^2/kg^2

Circumference of a circle = $2\pi r$ Area of a circle = πr^2
Volume of a sphere = $4/3\,\pi r^3$ Surface area of a sphere = $4\pi r^2$

Cartesian and polar coordinates:

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

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

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

Dot product: $\vec{A} \cdot \vec{B} = AB\cos\theta = A_xB_x + A_yB_y + A_zB_Z$

Kinematics:

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

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

Constant acceleration in one dimension:

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

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

Uniform circular motion: $f = 1/T = \omega/2\pi$; $v = 2\pi r/T = \omega r$;
$a = v^2/r = \omega^2 r = 4\pi^2 r/T^2 = 4\pi^2 f^2 r$

Friction: $f_s \le \mu_s N$ $f_k = \mu_k N$

Hooke's law: $F = -kx$ $U_{el} = ½\,kx^2$

Uniform gravity: $F_g = mg$ $U_g = mgh$

Newtonian gravity: $F_g = G\frac{m_1 m_2}{r^2}$ $U_g = -G\frac{m_1 m_2}{r}$

Newton's laws of motion: $(\Sigma\vec{F} = \vec{0}) \Leftrightarrow (\vec{a} = \vec{0})$ $\vec{a} = \Sigma\vec{F}/m$ $\vec{F}_{A\to B} = -\vec{F}_{B\to A}$

Work and energy: $W = \vec{F} \cdot \vec{s}$ $K = ½\,mv^2$ $\Sigma W = \Delta K$ $E_1 + W_N = E_2$

Impulse and momentum: $\vec{J} = \vec{F}t$ $\vec{p} = m\vec{v}$ $\Sigma\vec{J} = \Delta\vec{p}$ $\vec{p}_1 = \vec{p}_2$