PHYS 1050 Tutorial 3: Formula Sheet

Mathematics

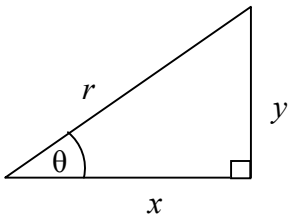
Quadratic equation:

$$ax^2 + bx + c = 0$$

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

Trigonometry:

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



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

Calculus:

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

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

Constants and Units

$k = 10^3$, $\mu = 10^{-6}$, $n = 10^{-9}$

$g = 9.80$ m/s^2
1 N = 1 kg m/s^2
1 J = 1 kg m^2/s^2

Constant acceleration in one dimension

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

Uniform circular motion

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

$$T = \frac{2\pi r}{v}$$ period

Particle Dynamics

$$\vec{F} = m\vec{a}$$

$$W = mg$$ weight

$$f_s \le \mu_s F_N$$ static friction
$$f_k = \mu_k F_N$$ kinetic friction

Kinetic energy and Work

$$K = \tfrac{1}{2} m v^2$$ kinetic energy
$$W = \vec{F} \cdot \vec{d} = \vec{F} \cdot \Delta\vec{x}$$ work by constant force
$$\Delta K = K_f - K_i = W$$

$$W_g = -mg\Delta y$$ work by gravitational force

$$W = \int_{x_i}^{x_f} F(x)\,dx$$ work by variable force

$$F_s = -kx$$ spring force (Hooke's Law)
$$W_s = \tfrac{1}{2} k x_i^2 - \tfrac{1}{2} k x_f^2$$