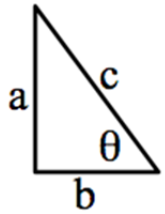
Physics I. Formula Sheet

Right triangle:



$\sin\theta = a/c$
$\cos\theta = b/c$
$\tan\theta = a/b$
$c^2 = a^2 + b^2$

Quadratic Formula:
$Ax^2 + Bx + C = 0$ has solutions:

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

Misc Formulas:
Circumference of a circle = $2\pi R$
Area of a circle = πR^2
Surface Area of a Sphere = $4\pi R^2$
Volume of sphere = $(4/3)\pi R^3$
Volume of cylinder = $\pi R^2 L$

Differentiation:
$dx^n/dx = nx^{n-1}$ $(n \neq 0)$
$d\cos(x)/dx = -\sin(x)$ (x in radians)
$d\sin(x)/dx = \cos(x)$ (x in radians)
$d(f(x) + g(x))/dx = df(x)/dx + dg(x)/dx$

Integration: $\int x^n dx = \frac{x^{n+1}}{n+1} + C$

1-D Motion:
displacement = Δx
$v_{average}$: $\Delta x/\Delta t = (x_2 - x_1)/(t_2 - t_1)$
$a_{average}$: $\Delta v/\Delta t = (v_2 - v_1)/(t_2 - t_1)$

Given $x(t)$
$v(t) = dx/dt$ (instantaneous)
$a(t) = dv/dt = d^2x/dt^2$ (instantaneous)

1-D Motion with Const. Acc.:
$x(t) = x_0 + v_{0x}t + (1/2)\,at^2$
$v(t) = v_0 + at$
$v^2 = v_0^2 + 2a(x - x_0)$

Projectile Motion:
$x(t) = x_0 + v_{0x}t$
$v_x(t) = v_{0x}$
$a_x(t) = 0$
$y(t) = y_0 + v_{0y}t + (1/2)\,a_y t^2$
$v_y(t) = v_{0y} + a_y t$
$a_y(t) = a_y$

For motion over level ground
Range = $[v_0^2 \sin(2\theta_0)]/g$

Acceleration due to gravity:
g = 9.8 m/s^2 downward

Equations connect. trans./rotat. motion
$v_{tan} = R\omega$
$a_{tan} = R\alpha$

Rotat. kinematic eq-ns with const. angular acceleration
$\omega(t) = \omega_0 + \alpha t$
$\theta(t) = \theta_0 + \omega_0 t + (1/2)\alpha t^2$
$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$
Centripetal acceleration:
$a_R = v^2/R$; $a_R = \omega^2 R$

Newton's Second Law:
$\vec{F}_{net} = \sum \vec{F}_{ext} = m\vec{a}$
Rotat. Newton 2nd law
$\sum \vec{\tau} = I\vec{\alpha}$
$\sum \vec{\tau} = \frac{d\vec{L}}{dt}$