PHYSICS FORMULAS

Kinematics:

$v = u + at$

$s = ut + \frac{1}{2} at^2$

$v^2 = u^2 + 2as$

Average velocity $= (u+v)/2$

Projectile Motion:

$T = 2u \sin\theta / g$

$R = u^2 \sin2\theta / g$

$H = u^2 \sin^2\theta / 2g$

Newton's Laws & Friction:

$F = ma$

Weight $= mg$

Static friction $f_s \leq \mu_s N$

Kinetic friction $f_k = \mu_k N$

Circular Motion:

$a_c = v^2/r = \omega^2 r$

$F_c = mv^2/r$

$v = r\omega$

$T = 2\pi/\omega$

Work Power Energy:

$W = Fs \cos\theta$

$KE = \frac{1}{2} mv^2$

$PE = mgh$

Power $= W/t = Fv$

Centre of Mass:

$X_{cm} = \Sigma m x_i / \Sigma m$

Rotation:

$\omega = \omega_0 + \alpha t$

$\theta = \omega_0 t + \frac{1}{2} \alpha t^2$

$\tau = I\alpha$

$L = I\omega$

$KE_{rot} = \frac{1}{2} I\omega^2$

Parallel axis: $I = I_{cm} + Md^2$

Gravitation:

$F = GMm/r^2$

$g = GM/r^2$

$V = -GM/r$

Escape velocity $= \sqrt{2GM/R}$

Elasticity:

Stress $= F/A$

Strain $= \Delta L/L$

$Y = $ stress/strain

Fluids:

Density $= m/V$

Pressure $= F/A$

Buoyant force $= \rho Vg$

$A_1v_1 = A_2v_2$

Bernoulli: $P + 1/2\rho v^2 + \rho gh = $ constant

Thermal Expansion:

$\Delta L = \alpha L \Delta T$

$\Delta A = 2\alpha A \Delta T$

$\Delta V = 3\alpha V \Delta T$

Calorimetry:

$Q = mc\Delta T$

$Q = mL$

KTG:

$PV = nRT$

$v_{rms} = \sqrt{3RT/M}$

Thermodynamics:

$\Delta U = Q - W$

Isothermal: $Q = W$

Adiabatic: $Q = -\Delta U$

MATHS FORMULAS

Basic Identities:

$(a+b)^2 = a^2 + 2ab + b^2$

$(a-b)^2 = a^2 - 2ab + b^2$

$a^2 - b^2 = (a-b)(a+b)$

Sets:

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Functions:

$(f \blacksquare g)(x) = f(g(x))$

Trigonometry:

$\sin^2\theta + \cos^2\theta = 1$

$1 + \tan^2\theta = \sec^2\theta$

$1 + \cot^2\theta = \csc^2\theta$

Sequences:

AP nth term $= a + (n-1)d$

AP sum $= n/2[2a + (n-1)d]$

GP nth term $= ar^{(n-1)}$

GP sum $= a(1-r^n)/(1-r)$

Quadratic:

$x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$

Sum of roots $= -b/a$

Product of roots $= c/a$

Straight Lines:

Slope $m = (y_2 - y_1)/(x_2 - x_1)$

Line: $y = mx + c$

Distance $= |Ax+By+C|/\sqrt{(A^2+B^2)}$

Limits:

$\lim_{x \to 0} \sin x/x = 1$

$\lim_{x \to 0} (1-\cos x)/x^2 = 1/2$

Permutations:

$nPr = n!/(n-r)!$

Combinations:

$nCr = n!/[r!(n-r)!]$

Binomial:

$(a+b)^n = \Sigma\, nCr\, a^{(n-r)}\, b^r$

Conic Sections:

Circle: $(x-h)^2 + (y-k)^2 = r^2$

Parabola: $y^2 = 4ax$

Ellipse: $x^2/a^2 + y^2/b^2 = 1$

Hyperbola: $x^2/a^2 - y^2/b^2 = 1$