ANGULAR MOTION

Equations of angular motion are relevant wherever you have rotational motions around an axis. When the object has rotated through an angle of θ with an angular velocity of ω and an angular acceleration of α, then you can use these equations to tie these values together.

CARNOT ENGINES

A heat engine takes heat, Qh, from a high temperature source at temperature Th and moves it to a low temperature sink (temperature Tc) at a rate Qc and, in the process, does mechanical work, W. (This process can be reversed such that work can be performed to move the heat in the opposite direction — a heat pump.) The amount of work performed in proportion to the amount of heat extracted from the heat source is the efficiency of the engine. A Carnot engine is reversible and has the maximum possible efficiency, given by the following equations. The equivalent of efficiency for a heat pump is the coefficient of performance.

FLUIDS

A volume, V, of fluid with mass, m, has density, ρ. A force, F, over an area, A, gives rise to a pressure, P. The pressure of a fluid at a depth of h depends on the density and the gravitational constant, g. Objects immersed in a fluid causing a mass of weight, Wwater displaced give rise to an upward directed buoyancy force, Fbuoyancy. Because of the conservation of mass, the volume flow rate of a fluid moving with velocity, v, through a cross-sectional area A, is constant. Bernoulli's equation relates the pressure and speed of a fluid.

A mass, m, accelerates at a rate, a, due to a force, F, acting. Frictional forces, FF, are in proportion to the normal force between the materials, FN, with a coefficient of friction, μ. Two masses, m1 and m2, separated by a distance, r, attract each other with a gravitational force, given by the following equations, in proportion to the gravitational constant G:

MOMENTS OF INERTIA

The rotational equivalent of mass is inertia, I, which depends on how an object's mass is distributed through space