1 Minimum Exhaust Speed

A rocket has an initial mass of m and a constant fuel burn rate of α. The acceleration do to gravity is g. What is the minimum exhaust speed that will allow the rocket to lift off immediately after firing?

2 Bouncing a Ball

A steel ball strikes a smooth heavy steel plate at an angle of 30° from the normal, and with speed of $u = 5$ m/s. The coefficient of restitution is 0.8. At what angle, α, and speed, v, does the steel ball bounce off the plate with?

3 Maximum Momentum

A rocket starts from rest in free space (no gravity). The exhaust speed, u, is constant. At what fraction of the initial rocket mass, m/m_0 , is the momentum of the rocket a maximum?

4 Energy from a Rocket Engine

A rocket in outer space starts from rest and accelerates with constant acceleration a, until its final speed is v. The initial mass of the rocket is m_0. The relative rocket exhaust speed is the constant u. How much work does the rocket's engine do? Include the work on the expended mass and the rocket.