
PHY 140Y - FOUNDATIONS OF PHYSICS
2001-2002
Tutorial Questions #3
October 1/2

Motion in More than One Dimension and Projectile Motion

1. A projectile is launched over flat ground. At what angles with respect to the ground should the launcher be oriented so that the projectile's range is half its maximum range? Neglect air resistance.
2. A ball is shot with an initial speed v_0 from the floor of a large gymnasium of height H , as shown below. What is the maximum horizontal distance it can travel (in terms of H and v_0) without touching the roof? Derive ALL the relevant equations. Neglect air resistance.



3. A person throws a rock from the top of a tower at speed V and at an angle of 45° up from the horizontal. The rock is in flight for 4.00 seconds and hits the ground 20.0 m from the base of the building. Neglect air resistance.
 - (a) What is the speed V ?
 - (b) How high off the ground is the top of the tower?
 - (c) What is the speed of the rock just before it hits the ground?

Uniform Circular Motion

4. When Apollo astronauts landed on the Moon, they left one astronaut behind in a circular orbit around the Moon. For the half of the orbit spent over the far side of the Moon, that individual was completely cut off from communication with the rest of humanity. How long did this lonely state last? Assume a sufficiently low orbit that you can use the Moon's surface gravitational acceleration (1.62 m/s^2) for the spacecraft; say the radius of the orbit is $1.74 \times 10^6 \text{ m}$.
5. How long would a day last if the Earth were rotating so fast that the acceleration of an object on the equator were equal to g ?