

A rocket's displacement is given by  $\vec{r}(t) = (10t\hat{x} + 2.0t^2\hat{y})$  m as a function of time. Find an expression for the (a) velocity and (b) acceleration of the rocket. What is the displacement and velocity at  $t = 10$  seconds.

An archer tries to hit a target that sits 10 m high on a castle wall that is 100 m away. If the archer aims at 60 degrees above the horizon, what speed must the arrow leave to hit this target.

An archer aims 30 degree above the horizon fires at a charging knight that is 200m downrange and moving toward the archer at 10 m/s. How fast does the arrow have to leave the archer in order to hit the knight? At what position from the archer does the arrow hit the knight?

A car moves along a circular track which has a radius of 30 m at a constant speed. If the passengers feel an acceleration of  $1 \text{ m/s}^2$  toward the center of the track, how fast is the car traveling?