1.) In an attempt to check the accuracy of the speedometer in your car, you drive 5 exits south on 95 at constant speed v_0 in 20 minutes. You turn around and drive back at constant higher speed $v_0 + 20\,\text{mph}$ in 15 minutes.

a) Find the speed v_0 during the first leg of your trip.

b) Find the distance covered in these 5 exits on 95.

2.) A bullet is fired from a toy cannon that is placed 1 m away from the goal post. The bullet barely clears the crossbar that is 3.1 m above ground. Neglect the height of the cannon.

a) Find the *vertical* component of the velocity of the bullet when it leaves the cannon.

b) Find the *horizontal* component of the velocity of the bullets when it leaves the cannon.

1.) A particle is moving in the xy-plane. The position vector at time t is $\vec{r}(t) = x(t)\hat{\imath} + y(t)\hat{\jmath}$. At time $t = 16\,\mathrm{s}$, the position is $\vec{r}(16\,\mathrm{s}) = -5.0\,\mathrm{m}\hat{\imath} + 6.0\,\mathrm{m}\hat{\jmath}$ and the velocity is $\vec{v}(16\,\mathrm{s}) = (4.0\,\mathrm{m/s})\hat{\imath} + (3.0\,\mathrm{m/s})\hat{\jmath}$. Between $t = 16\,\mathrm{s}$ and $t = 18\,\mathrm{s}$, the acceleration is constant $\vec{a} = (-1.0\,\mathrm{m/s^2})\hat{\imath} + (2.0\,\mathrm{m/s^2})\hat{\jmath}$.

a) What is the *speed* of the particle at time $t = 18\,\mathrm{s}$.

b) Find the position of the particle at time $t = 18\,\mathrm{s}$.

2.) A ball is thrown with an initial speed of 8.0 m/s from a roof top that is 25.0 m above ground. The ball is in 'air' for 2.0 seconds and then lands 5.0 m in front of the house.

a) Find the horizontal and vertical components of the initial velocity of the ball.

b) Find the maximum height of the ball above ground.