1) Find the velocity, acceleration, and speed of a particle with the given position function.

a) $\mathbf{r}(t) = \langle t^2 + 1, t^3, t^2 - 1 \rangle$

b) $\mathbf{r}(t) = \langle e^t \cos t, e^t \sin t, e^t \rangle$

2) Use the given acceleration function to find the velocity and position vectors. Then find the position at time $t = 2$.

a) $\mathbf{a}(t) = \mathbf{i} + \mathbf{j} + \mathbf{k},\ \mathbf{v}(0) = 0,\ \mathbf{r}(0) = 0$

b) $\mathbf{a}(t) = t\,\mathbf{i} + t^2\mathbf{j} + \cos 2t\,\mathbf{k},\ \mathbf{v}(0) = \mathbf{i} + \mathbf{k},\ \mathbf{r}(0) = \mathbf{j}$

3) The position function of a particle is given by: $\mathbf{r}(t) = \langle t^2, 5t, t^2 - 16t \rangle$. When is the speed a minimum?

4) What force is required so that a particle of mass m has the position function: $\mathbf{r}(t) = \langle t^3, t^2, t^3 \rangle$?

5) Find the vector function for the path of a projectile launched at a height of 10 feet above the ground with an initial velocity of 88 feet per second and at an angle of $30°$ above the horizontal.

6) Find the tangential and normal components of the acceleration vector.
   a) $\mathbf{r}(t) = \cos t\,\mathbf{i} + \sin t\,\mathbf{j} + t\,\mathbf{k}$
   b) $\mathbf{r}(t) = t\,\mathbf{i} + t^2\,\mathbf{j} + 3t\,\mathbf{k}$