Math 265 HW 1  Due Tuesday 9-17

1) A curve is described by the equations \( x = 6t^2 + 2, \ y = 2t, \ z = t^2 - t; \ (-\infty < t < \infty). \)
   a) Find parametric equations for the line that is tangent to the curve when \( t = 2. \)
   b) Find the symmetric form of the equations for the line.

2) Find the length of the curve \( x = \cos t + t \sin t, \ y = \sin t - t \cos t \) from 0 to \( 2\pi. \)

3) Let \( \mathbf{a} = \langle 7, 0 \rangle \) and \( \mathbf{b} = \langle 5, 1 \rangle. \)
   a) Find the cosine of the angle between \( \mathbf{a} \) and \( \mathbf{b}. \)
   b) Find the projection of \( \mathbf{a} \) on \( \mathbf{b}. \)

4) Find a vector of length 3 that is parallel to a line of slope -2.

5) Let \( \mathbf{r}(t) = 2t^2 \mathbf{i} + (4t + 2) \mathbf{j}. \)
   a) Find the velocity vector \( \mathbf{v} \) when \( t = 1 \)
   b) Find the speed when \( t = 1 \)
   c) Find the acceleration vector \( \mathbf{a} \) when \( t = 1. \)
   d) Find a unit tangent vector \( \mathbf{T} \) to the curve when \( t = 1. \)
   e) Find the curvature when \( t = 1 \)

6) Find the vector from the point (1,2) to the midpoint between (2,3) and (5,1). Draw a diagram indicating all relevant vectors.