Supplement to PS 3

1. Sketch the circle $\vec{\mathbf{r}}(t) = \cos(t)\vec{\mathbf{i}} - \sin(t)\vec{\mathbf{j}}$, and on that graph, draw the following vectors with their correct lengths.

   (a) $\vec{\mathbf{r}}\,'(\pi/4)$

   (b) $\vec{\mathbf{r}}\,''(\pi)$

2. Find parametric equations of the line tangent to the graph of $\vec{\mathbf{r}}(t) = \ln(t)\vec{\mathbf{i}} + e^{-t}\vec{\mathbf{j}} + t^3\vec{\mathbf{k}}$ at the point where $t = 2$.

3. Solve the vector initial-value problem $\vec{\mathbf{y}}\,''(t) = 12t^2\vec{\mathbf{i}} - 2t\vec{\mathbf{j}}$ for $\vec{\mathbf{y}}(t)$ by integrating and using the initial conditions $\vec{\mathbf{y}}(0) = 2\vec{\mathbf{i}} - 4\vec{\mathbf{j}}$, $\vec{\mathbf{y}}\,'(0) = \vec{\mathbf{0}}$ to find the constants of integration.