UNIT TANGENTS AND NORMALS

(1-5) For each of the following curves (1-5), find the unit tangent and the unit normal at the indicated value for *t*. Also, graph the curve along with the unit tangent and normal you found.

1. $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j}$, $0 \le t \le 2\pi$, $t = \dfrac{\pi}{4}$

2. $\vec{r}(t) = 2\cos(t)\hat{i} - 2\sin(t)\hat{j}$, $0 \le t \le 2\pi$, $t = \dfrac{5\pi}{4}$

3. $\vec{r}(t) = (2+3t)\hat{i} + (1+4t)\hat{j}$, $0 \le t \le 2$, $t = 1$

4. $\vec{r}(t) = t\hat{i} + t^2\hat{j}$, $-2 \le t \le 2$, $t = 1$

5. $\vec{r}(t) = \sin t\hat{i} + t\hat{j}$, $0 \le t \le 2\pi$, $t = \pi$

6. If $T(t)$ is the unit tangent vector for a curve describe by $\vec{r}(t)$, then show that T and T' are perpendicular to one another.