

CURVATURE

For each of the following curves, find the curvature at the indicated value for t . Also, state the radius of the best fitting circle at this point (circle radius = $r = \frac{1}{\kappa}$). If $\kappa = 0$, then state that circle radius = ∞ .

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

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

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

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

5. $\vec{r}(t) = t\hat{i} + t^2\hat{j}$, $-2 \leq t \leq 2$, $t = 0$

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