

Homework Section 13.2

1. Sketch the given vector-value function, $\mathbf{r}(t)$, in the plane. Then find $\mathbf{r}'(t)$ and sketch the position vectors for $\mathbf{r}(t)$ and $\mathbf{r}'(t)$ for the given value of t .

a) $\mathbf{r}(t) = \langle 2 \cos t, 2 \sin t \rangle$, $t = \pi/3$

b) $\mathbf{r}(t) = t^2 \mathbf{i} + t \mathbf{j}$, $t = -2$

2. find $\mathbf{r}'(t)$:

a) $\mathbf{r}(t) = 2t \mathbf{i} + (1-t) \mathbf{j} - 3t \mathbf{k}$

b) $\mathbf{r}(t) = \left\langle t^2, \frac{5}{t}, \sqrt{2t-1} \right\rangle$

c) $\mathbf{r}(t) = 2t \mathbf{i} + e^{3t} \mathbf{j} - \cos^2 t \mathbf{k}$

d) $\mathbf{r}(t) = \frac{1}{e^{2t} + 1} \langle \sqrt{2}e^t, e^{2t}, -1 \rangle$

3. Find the unit tangent vector at the given value of t .

a) $\mathbf{r}(t) = 2t \mathbf{i} + (1-t) \mathbf{j} - 3\sqrt{t} \mathbf{k}$, $t = 4$

b) $\mathbf{r}(t) = \langle t, 2 \sin t, 2 \cos t \rangle$, $t = \pi/6$

4. Find the parametric equations of the tangent line to $\mathbf{r}(t) = 2t \mathbf{i} + (1-t) \mathbf{j} - 3\sqrt{t} \mathbf{k}$ at the point $(8, -3, -6)$.

5. Give the t intervals on which the given curve is smooth.

a) $\mathbf{r}(t) = 2t \mathbf{i} + e^{3t} \mathbf{j} - \cos^2 t \mathbf{k}$

b) $\mathbf{r}(t) = \langle t^2, 5t^3, t^4 \rangle$

c) $\mathbf{r}(t) = \left\langle t^2, \frac{5}{t}, \sqrt{2t-1} \right\rangle$

6. Evaluate the integral:

a) $\int_0^2 (9t^2 \mathbf{i} + 4t \mathbf{j} + 15t^4 \mathbf{k}) dt$

b) $\int (2t \mathbf{i} + e^{3t} \mathbf{j} - \sin t \cos^2 t \mathbf{k}) dt$

7. Find $\mathbf{r}(t)$ given $\mathbf{r}'(t) = 3t^2 \mathbf{i} + 4t \mathbf{j} + 5t^4 \mathbf{k}$ and $\mathbf{r}(0) = \mathbf{k}$