

Math 53 Discussion Problems Sept 24

1. Sketch the curve and find the line tangent to the curve at the given point.

(a) $\mathbf{r}(t) = \langle t, t, t^2 \rangle, t = 2$

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

(c) $\mathbf{r}(t) = \langle \sin^2 t, \cos^2 t, \tan^2 t \rangle, t = \frac{\pi}{4}$

2. Evaluate the integrals.

(a) $\int_1^4 \left[\frac{1}{t} \mathbf{i} + \frac{1}{5-t} \mathbf{j} + \frac{1}{2t} \mathbf{k} \right] dt$

(b) $\int_{-\pi/4}^{\pi/4} [(\sin t) \mathbf{i} + (1 + \cos t) \mathbf{j} + (\sec^2 t) \mathbf{k}] dt$

3. Find the arc length of the curves.

(a) $\mathbf{r}(t) = \langle t \cos t, t \sin t, \frac{2\sqrt{2}}{3} t^{3/2} \rangle, 0 \leq t \leq \pi$

(b) $\mathbf{r}(t) = \langle 6 \sin(2t), 6 \cos(2t), 5t \rangle, 0 \leq t \leq \pi$