

Reparameterize the curve with respect to arc length

1. $\mathbf{r}(t) = \langle 1 - t, 4t + 3, 6t \rangle$

2. $\mathbf{r}(t) = \langle 5 \sin t, 3 \cos t, 4 \cos t \rangle$

3. $\mathbf{r}(t) = \langle [\ln(t + 1)]^3, 6, 7 \rangle$

Find the curvature of the following functions

4. $\mathbf{f}(t) = \langle 2 \sin t, 5t, 2 \cos t \rangle$

5. $\mathbf{f}(t) = \langle t^2, \sin t - t \cos t, \cos t + t \sin t \rangle$

6. $\mathbf{f}(t) = \langle t\sqrt{2}, e^t, e^{-t} \rangle$

Find the curvature of the following functions using the cross product

7. $\mathbf{f}(t) = \langle t^2, 0, t \rangle$

8. $\mathbf{f}(t) = \langle t, t, 1 + t^2 \rangle$

9. (a) Imagine a parabola. Where do you expect to have higher and lower curvature?
- (b) Look at the equations of the last 5 problems. Which describes parabola?
- (c) In that problem, where is the curvature highest and lowest?
- (d) Does this match your intuition from part (a)?