

MATH 152, Fall 2019

Worksheet 9

1. The positions of two particles A and B at time t are given by

$$\begin{cases} \mathbf{r}(t) &= < 1 - \cos(t/2), 4 \cos^2(t/2) - 4 \cos(t/2) > \\ \mathbf{R}(t) &= < \frac{9}{4}t - 1, \frac{9}{4}t > \end{cases}$$

(a) At what points do the paths intersect ?

(b) At what times do the paths intersect ?

2. Find the length of that portion of the curve

$$\begin{cases} x &= 6t^2 \\ y &= \frac{4}{3}t^3 - 9t^2 \end{cases}$$

which lies between the origin and the point $(54, 9)$.

3. Find the length of the logarithmic spiral $r(\theta) = e^\theta$, between $\theta = 0$ and $\theta = \pi/4$.
4. Show that the curve $r = \sin \theta \tan \theta$ (called a **caisson of Diocles**) has the line $x = 1$ as a vertical asymptote.
5. Show that the curves $r = a \sin \theta$ and $r = a \cos \theta$ intersect at right angle.