

Math 210 (Lesieutre)
11.8: Length of curves
January 27, 2017

Problem 1. Let R be a circle centered at 0 with radius 5. Set up a parametrization $\mathbf{r}(t)$ for the circle, and use it to compute the circumference.

Problem 2. Consider the curve $\mathbf{r}(t) = \langle \cos t, \sin t, \frac{2}{3}t^{3/2} \rangle$. Compute the length of this curve between $t = 0$ and $t = 10$.

Problem 3. Consider a cardioid $r = 1 + \cos \theta$. Set up the integral for the arc length, and evaluate it if you can.

Problem 4. The circle in the first problem was not parametrized by arc length. Give another parametrization in which it is.

Problem 5. A batter hits a baseball with initial velocity $\langle 100, 100, 100 \rangle$ (a pop-up down the right field line; let's say the units are ft/sec).

a) What is $\mathbf{a}(t)$? Assume the only force acting on the ball is gravity.

b) Solve for $\mathbf{v}(t)$ and $\mathbf{r}(t)$.

c) At what time t does the ball hit the ground?

d) Set up the integral for the length of the path of the ball between the moment it left the bat and the moment it hit the ground.