

Math 210 (Lesieutre)
11.5: Lines and curves in space
January 20, 2017

Problem 1. Consider the line from $(1, 1, 1)$ to $(1, 2, 3)$.

a) Express a parametrization of the line in vector form.

b) Express your parametrization as three functions $x(t)$, $y(t)$, and $z(t)$.

c) At what time t does the line cross the plane $z = 10$?

d) What is the projection of the line onto the xy -plane?

Problem 2. Sketch the parametrized curves indicated below.

a) $\mathbf{r}(t) = \langle \cos t, \sin t, 1 \rangle$ for $0 \leq t \leq 4\pi$.

b) $\mathbf{r}(t) = \langle 0, 0, t \rangle$ for $0 \leq t \leq 5$

c) $\mathbf{r}(t) = \langle \cos t, \sin t, t \rangle$ for $0 \leq t \leq 4\pi$.

Problem 3. Do the two lines

$$\begin{aligned}\mathbf{r}_1(s) &= \langle s, 1 + s, 2s - 3 \rangle, \\ \mathbf{r}_2(t) &= \langle 2 - t, 2t, t \rangle\end{aligned}$$

intersect?

Problem 4. For what value of a do the two lines

$$\begin{aligned}\mathbf{r}_1(s) &= \langle 3 + s, 1 + s, a + s \rangle, \\ \mathbf{r}_2(t) &= \langle 2t + a, t + a, 0 \rangle\end{aligned}$$

intersect?

Problem 5. What is $\lim_{t \rightarrow 0^+} \mathbf{v}(t)$, where $\mathbf{v}(t) = \langle t, \frac{\sin t}{t}, e^{-1/t} \rangle$?