Recitation 29: Lines and curves in space - Instructor Notes

Warm up:

Find a vector-valued function for the line segment connecting the points $P = (-3, 7, 6)$ and $Q = (5, -4, 7)$ in such a way that the value at $t = 0$ is P and the value at $t = 1$ is Q. Also, find the point two-thirds of the way from P to Q.

Instructor Notes: A common mistake is to forget the domain of t.

Group work:

Problem 1 *Find a vector-valued function for the line through the point $(1, -2, 3)$ that is perpendicular to the lines*

$$\vec{r}_1(t) = \langle 7, 8, -2 \rangle + t\langle 3, 5, 7 \rangle \quad and \quad \vec{r}_2(s) = \langle 4, -3, -7 \rangle + s\langle 4, 9, -1 \rangle$$

Instructor Notes:

Problem 2 *Find the distance from the point $P(-1, 4, 3)$ to the line $\langle 8 + t, 3 - 3t, -26t \rangle$. Hint: The distance from the point to the line is the distance from the point P and the closest point on the line.*

Instructor Notes:

Problem 3 *Show that the curve* $\vec{r} = \langle t \cos t, t \sin t, t \rangle$ *lies completely on the cone* $z^2 = x^2 + y^2$.

Instructor Notes:

Problem 4 *Match each of the following curves to the corresponding vector-valued function.*

(a) $\langle 3, t^2, 5 \rangle$ (c) $\langle 3, \sin t, \cos t \rangle$ (e) $\langle \sin t, \cos t, 2 \cos t \rangle$

(b) $\langle 3, t^2, t \rangle$ (d) $\langle 3t, 5 \sin t, 5 \cos t \rangle$ (f) $\langle 2 \cos t, \sin t, \cos(3t) \rangle$
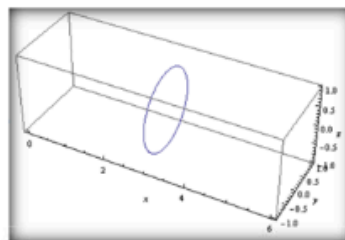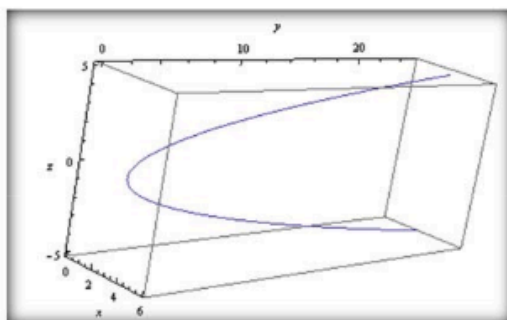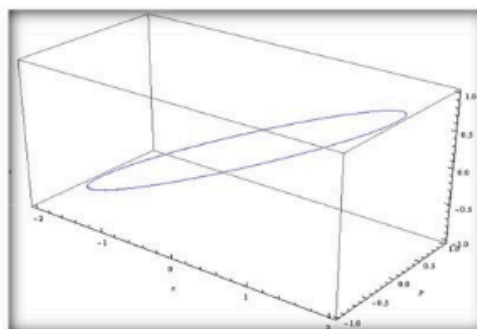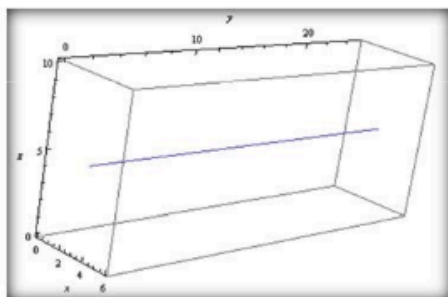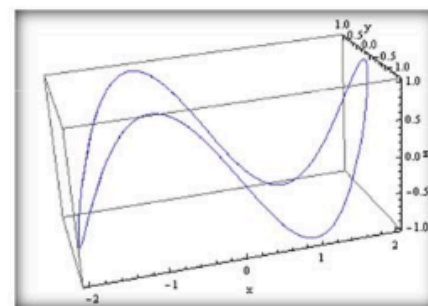
Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Instructor Notes: