Recitation 29: Lines and curves in space

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.

Group work:

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

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

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.*

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

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

(a) $\langle 3, t^2, 5\rangle$

(b) $\langle 3, t^2, t\rangle$

(c) $\langle 3, \sin t, \cos t\rangle$

(d) $\langle 3t, 5\sin t, 5\cos t\rangle$

(e) $\langle \sin t, \cos t, 2\cos t\rangle$

(f) $\langle 2\cos t, \sin t, \cos(3t)\rangle$

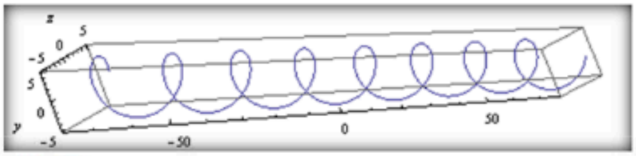

Figure 1

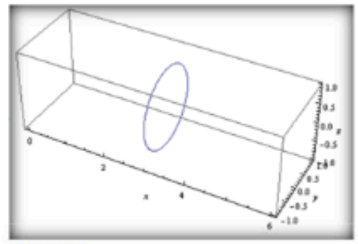

Figure 2

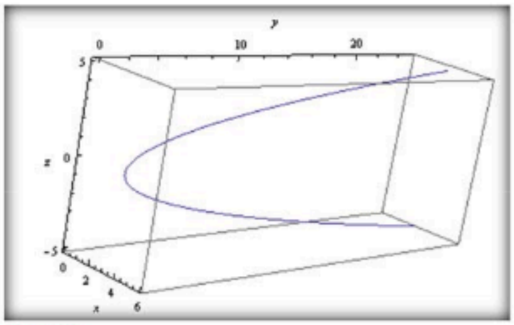

Figure 3

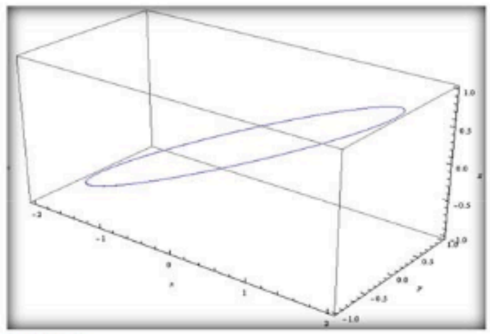

Figure 4

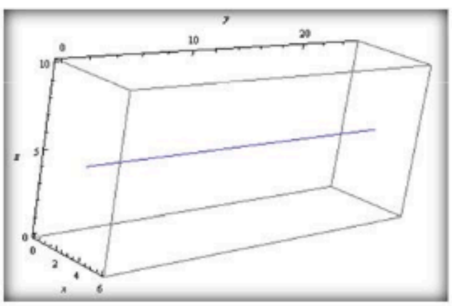

Figure 5

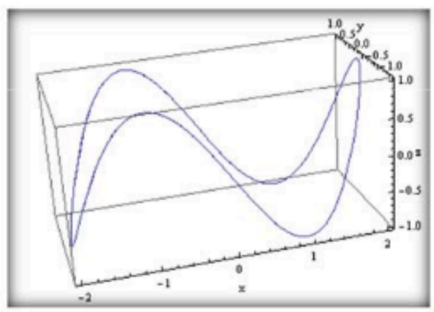

Figure 6