Math 234(003). Homework 4
Due Thursday, September 18th

Solve the following problems from the textbook:

- Section 1.12 (pp. 16-18): 15(cde), 16.
- Section 2.17 (pp. 31-33): 4.

Also, solve the following problems:

Consider the line ℓ parametrized by the function $t\vec{e}_1 + (1-t)\vec{e}_2 + (3t-3)\vec{e}_3$.

1. Does the line ℓ meet with the x-axis? If it does, find the intersection point.

2. What is the angle between the line ℓ and the vector $\vec{e}_1$? (The answer would not be pretty, and it is fine to leave it as arccos of a number.)

3. Find the intersection of the line ℓ and the plane $x - y - z = 0$.

4. What is the angle between the line ℓ and the plane $x-y-z=0$? (Once again, it is fine if the answer involves inverse trigonometric functions.)

5. The equations

$$\begin{cases} y = x^2 \\ z = 0 \end{cases}$$

represent a parabola in the xy-plane. Parametrize this parabola by a vector-valued function of one scalar variable.

6. What curve is parametrized by the equations

$$\begin{cases} x = \cos(t) + 1 \\ y = 3\cos(t) \\ z = 2 - \cos(t)? \end{cases}$$

7. Two planes in space meet along a line. (Which is the usual situation, unless the planes happen to be parallel or they coincide).

If the normal vectors of the planes are $\vec{n}$ and $\vec{u}$, how to find a vector in the direction of the line?

8. For planar motion

$$x = 2\cos(t)$$
$$y = \sin(t),$$

where time t varies from 0 to π, find when the speed of the motion is maximal and when it is minimal.