

# Homework 1: Vectors

**Due:** Tuesday September 18th, 16:00

**Policy:** Collaboration is allowed, but every student is required to hand in his/her own version of the solutions. Please include your name and student number on the solutions.

**Problem 1.** Consider a particle in one dimension, whose position as function of time  $t$  is given by

$$x(t) = \alpha t \cos(\omega t).$$

1. Give the dimensions of the constants  $\alpha$  and  $\omega$ .
2. Give the velocity  $v(t)$  and the acceleration  $a(t)$ .

**Problem 2.** Recall the geometric definition of the scalar product

$$\mathbf{A} \cdot \mathbf{B} = AB \cos(\theta),$$

where  $A$  and  $B$  are the lengths of the vectors  $\mathbf{A}$  and  $\mathbf{B}$ , and  $\theta$  is the angle ( $< \pi$ ) between the two vectors. Proof using the geometric definition, that the scalar product is distributive over addition, that is

$$(\mathbf{A} + \mathbf{B}) \cdot \mathbf{C} = \mathbf{A} \cdot \mathbf{C} + \mathbf{B} \cdot \mathbf{C}.$$