

Mathematical basics:

vectors

Please solve at least 4 exercises for 2 bonus points. Deadline: 11/09

1. Given vectors $\mathbf{a}=[1;1]$, $\mathbf{b}=[0;-5]$ and $\mathbf{c}=[-3;7]$. Determine the vector $\mathbf{d}=4\mathbf{a}+3\mathbf{b}-\mathbf{c}$ and its length!
2. Given a parallelogram ABCD: A(1;3), B(4;7), C(2;8), D(-1;4). What are the distances between the opposite vertices?
3. Given a line segment AB: A(1;1), B(7;5), which is divided to 3 equal part by points C and D. Determine the coordinates of points C and D!
4. Break up vector $\mathbf{a}=[-2;6]$ into components, which are parallel to the coordinate axes! (*Very easy*)
5. Determine the scalar product of vectors $\mathbf{a}=[-2;-5]$ and $\mathbf{b}=[3;3]$! Also determine the angle between the two vectors! Determine the magnitude of the vector product (cross product) assigned to the vectors \mathbf{a} and \mathbf{b} if 0 is added as 3rd coordinate! Using this latter, calculate the angle between vectors \mathbf{a} and \mathbf{b} !
6. Given a triangle ABC: A(2,5), B(10,3), C(5,8). Determine the angle at vertex B (solve the problem by using the scalar product)! Determine the area of the triangle! (*Half of the area of an appropriate parallelogram*)
7. How much is α , if vectors $\mathbf{a}=[2;6]$ and $\mathbf{b}=[3;\alpha]$ are perpendicular to each other (*use the scalar product*)?
8. Given three vertices of the parallelogram ABCD: A(0;2), B(4;-3), C(2;-7). Determine the area of the parallelogram (*use the vector product for the solution*)! Determine the coordinates of the fourth vertex D!
9. Determine the orthogonal projection of vector $\mathbf{a}=[-2;-5]$ to a line which closes 45° angle with axis x !