MATH8213 ASSIGNMENT1

Q1.In 2D affine space endowed with orthonormal frame, given a triangle with vertices

$A(4,4), B(-6,-1), C(-2,4) \to T1$; $A(5,4), B(-1,2), C(5,1) \to T2$

$A(-2,-3), B(1,4), C(3,1) \to T3$; $A(-2,3), B(4,1), C(6,-5) \to T4$

a) Using the scalar product, find the perimeter, area and angles of the triangle

b) Use 2D Geo-Gebra to plot the triangle

Q2. In 3D Euclidean space equipped with orthonormal frame, given a tetrahedron with vertices

$A(2,-1,1), B(5,5,4), C(3,2,-1), D(4,1,3) \to T4$, $A(3,-1,0), B(0,-7,3), C(-2,1,-1), D(3,2,6) \to T3$

$A(2,1,-1), B(3,0,2), C(5,1,1), D(0,-1,3) \to T2$; $A(2,3,7), B(1,4,9), C(-4,0,5), D(-2,3,-5) \to T1$

a)Using scalar or cross or box products, find:

i)The perimeter, and angles of the face ABC ii) The area and volume of the tetrahedron

b) Use 3D Geo-Gebra to plot the tetrahedron

Q3. The polar coordinates of the end points of the segment AB are:

$A\left(8, \frac{-2\pi}{3}\right), B\left(6, \frac{\pi}{3}\right) \to T1\,\&\,4$; $A\left(12, \frac{4\pi}{9}\right), B\left(12, \frac{4\pi}{9}\right) \to T2\,\&\,3$

a) Find the length of the segment

b) Determine the polar coordinates of the midpoint of the segment

c) Plot the above given line segment and its mid-point

Q4. **Use 2D-Geogebra and plot on the same chart the graphs of the following 2d-curves expressed in polar coordinates.**

a) $r = 3(1 \pm \cos\theta)$; $r = 3(1 \pm \cos\theta)$; *b*) $r = 6\cos 2\theta$; $r = 6\sin 2\theta$

c) $r = 0.125\theta$; $r = 2^{-\theta}$; $r = 2^{\theta}$; d) $r = 4\sqrt{\cos 2\theta}$; $r = 4\sqrt{\sin 2\theta}$ **All teams will do Q4**

***Note**: Teams Leaders are requested to ensure if their team members are working in team spirit way*.

Ti stands for Team i (i=1,2,3,4)

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