CZ2003 Tutorial 4 (2018/19, Semester 2)

Planes, polygons and bilinear surfaces

1. **Using an equation in intercept**s, write an implicit equation of the plane which intersects the Cartesian coordinate axes X, Y and Z at the three points with coordinates P_1=(2, 0, 0), P_2=(0, 4, 0) and P_3=(0, 0, 6), respectively.

2. Write an implicit equation of a plane which passes through the point with Cartesian coordinates (1, 2, 3) while being orthogonal to the straight line defined by $x = u + 1$, $y = u - 2$, $z = 2u + 1$, $u \in (-\infty, \infty)$.

3. Propose how to define parametrically with functions *x(u,v), y(u,v), z(u,v)* a plane passing through points with coordinates (-4,0,0), (0,4,0), (2,0,4).

4. (a) A bilinear surface is defined by four points P_1=(-1, 1, -1), P_2=(1, 0, -1), P_3=(-1, 0, 1) and P_4=(1, 0.5, 1) and two parametric coordinates $u \in [0,1]$ and $v \in [0,1]$, as illustrated in Figure Q3. Write parametric equations defining the bilinear surface.

   (b) What are the coordinates of the point with the parametric coordinates 0.8, 0.8?

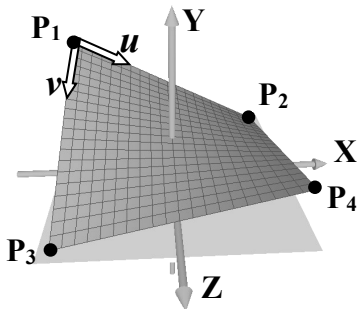

Figure Q3

5. Write parametric equations $x(u, v)$, $y(u, v)$, $z(u, v)$, $u, v \in [0, 1]$ defining a triangular polygon which is bounded by the three segments defined by:

$x = 1 + 2u$	$y = 1 + u$	$z = 1 - u$	$u \in [0, 1]$
$x = 3 - u$	$y = 2 + u$	$z = 4u$	$u \in [0, 1]$
$x = 2 - u$	$y = 3 - 2u$	$z = 4 - 3u$	$u \in [0, 1]$.