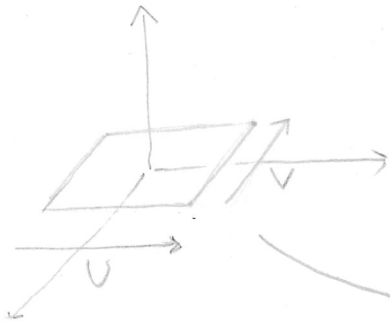# Plane

Square with 1×1 dimensions

To define lines with NURBS

degrees in $U = 1$
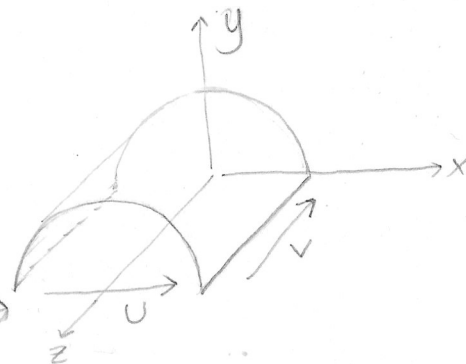$V = 1$

Total of 4 control points

↓

coincide with square vertices
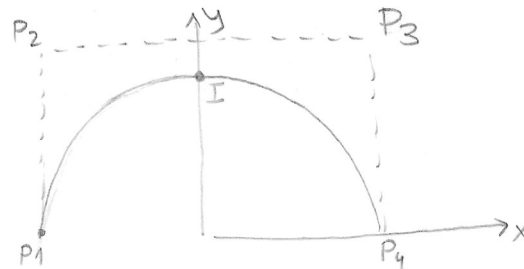
Cylinder

Curved surface
Basic case: $R = 0.5$; $h = 1$

Think of the cylinder as a plane which was "pulled" up.

In V we still have a line, but in U we have now a quadratic curve.

degrees in $U = 3$
$V = 1$

P_1 / P_4 coincide with vertices

P_2 / P_3 must be calculated so that $I = 0, 0.5$
$\underbrace{\qquad}_{radius}$

Calculating P_2/P_3, using equation for Quadratic Bézier curves:

$$Q(t) = (1-t)^3 \cdot P_1 +$$
$$3t(1-t)^2 P_2 +$$
$$3t^2(1-t) \cdot P_3 +$$
$$t^3 \cdot P_4$$

Since we know the coordinates of I, which is in the middle of the curve ...

↓

$Q(0.5) = (0, 0.5) = I$

$P_1 = -0.5, 0$
$P_2 = -0.5, Y$
$P_3 = 0.5, Y$
$P_4 = 0.5, 0$

↳ Considering these values, we can calculate Y, and from there we can get the equation for any radius.