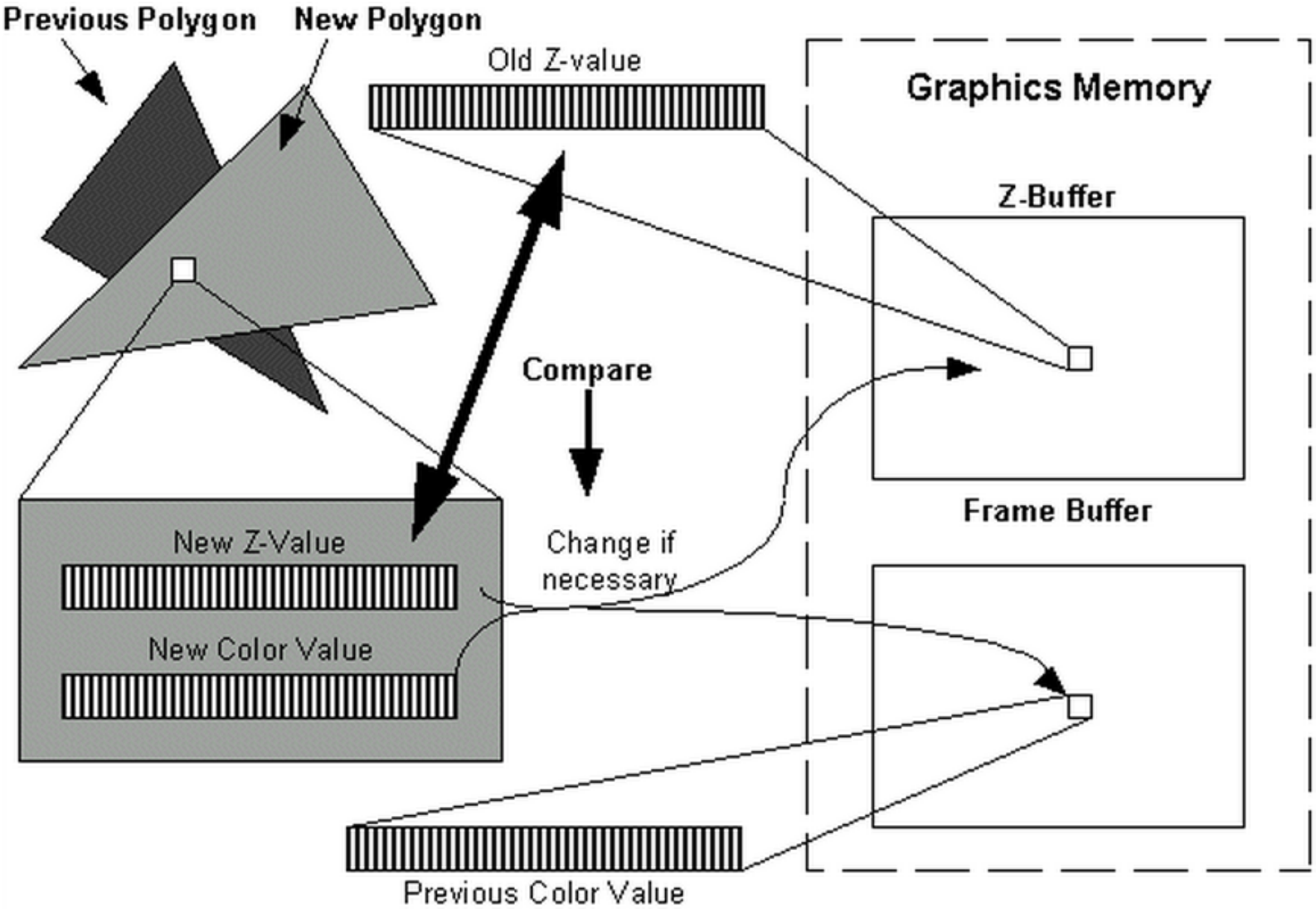
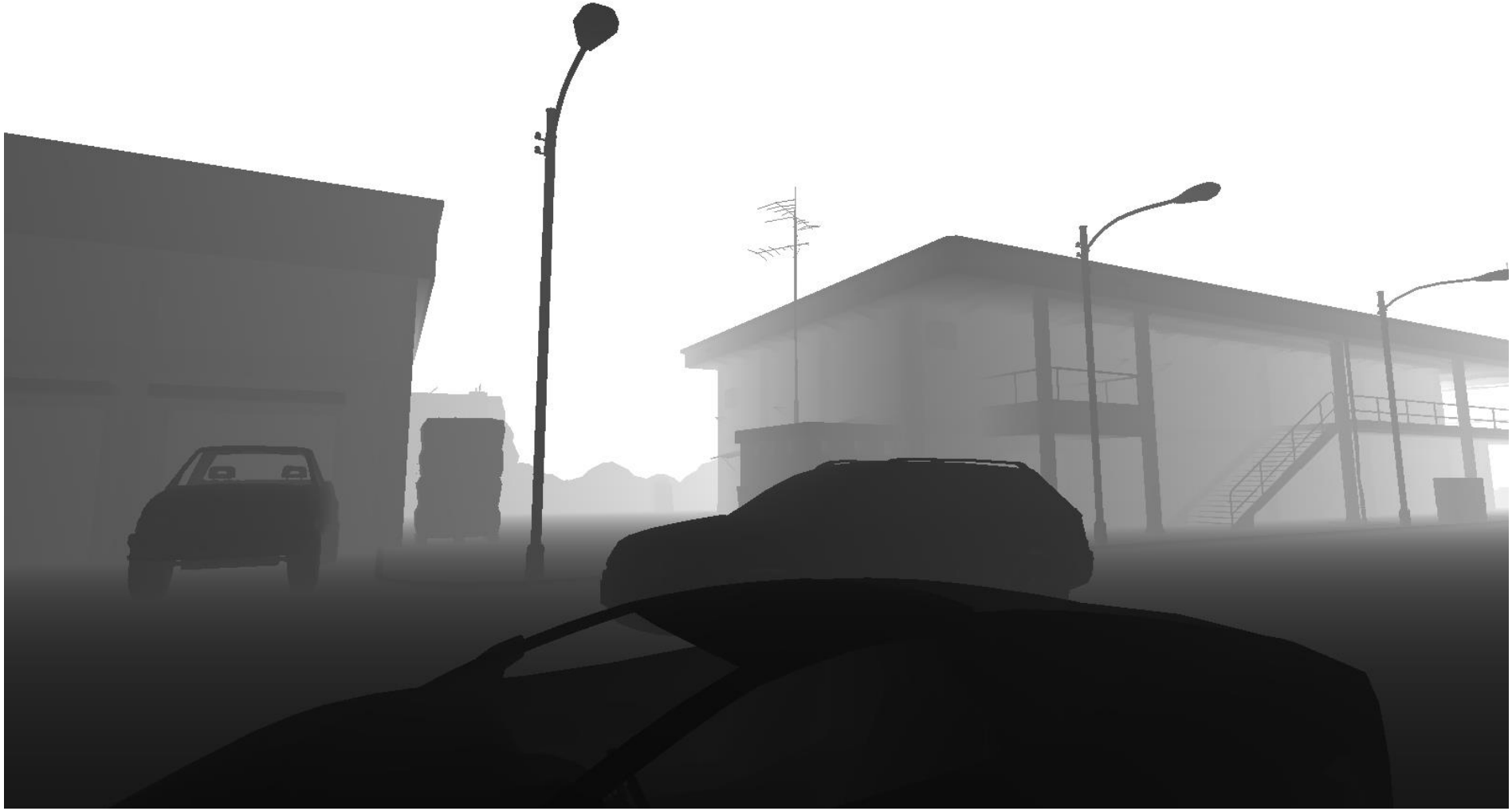
Z-buffer

Computer Graphics 1

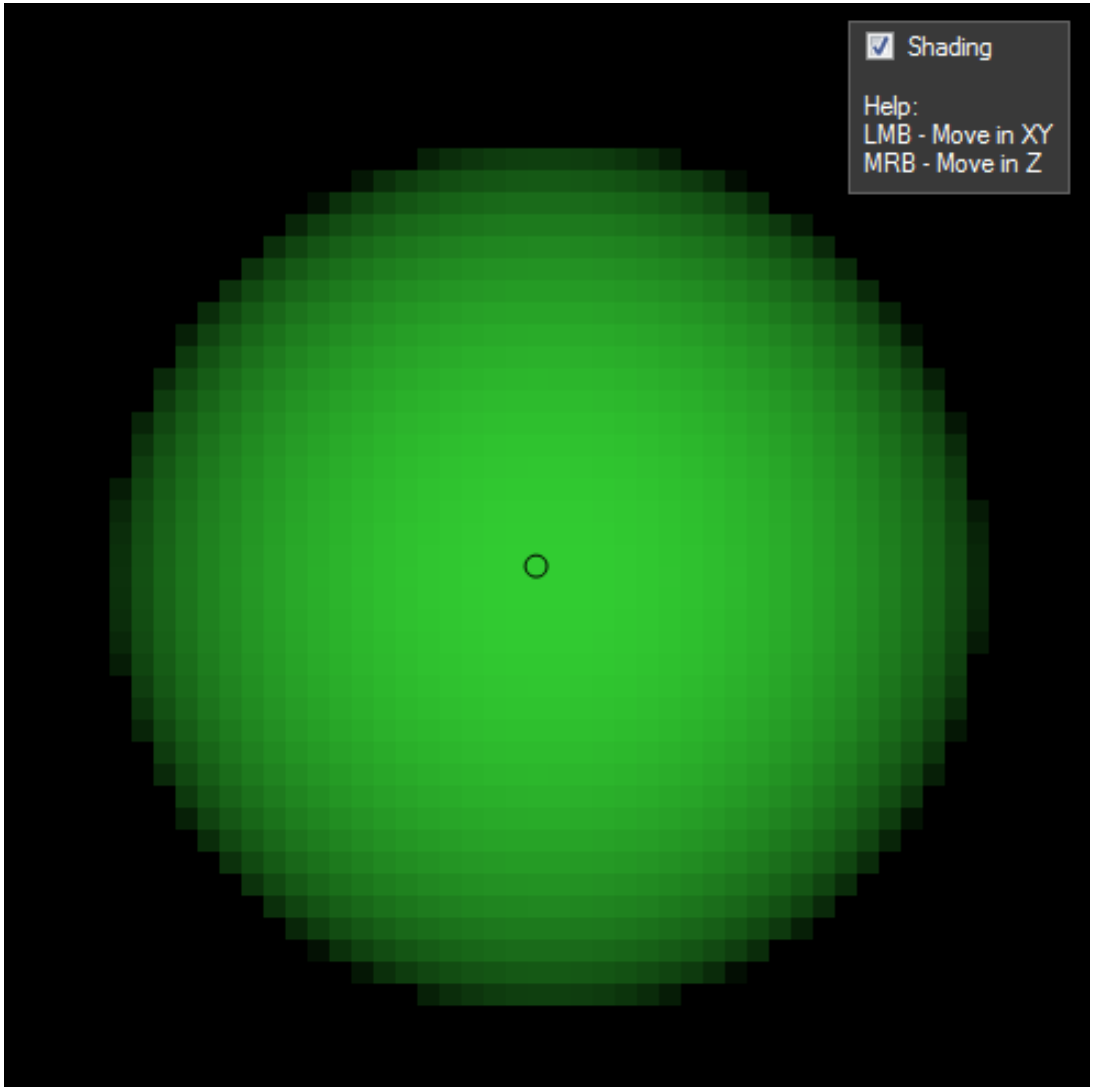
Algorithm Overview



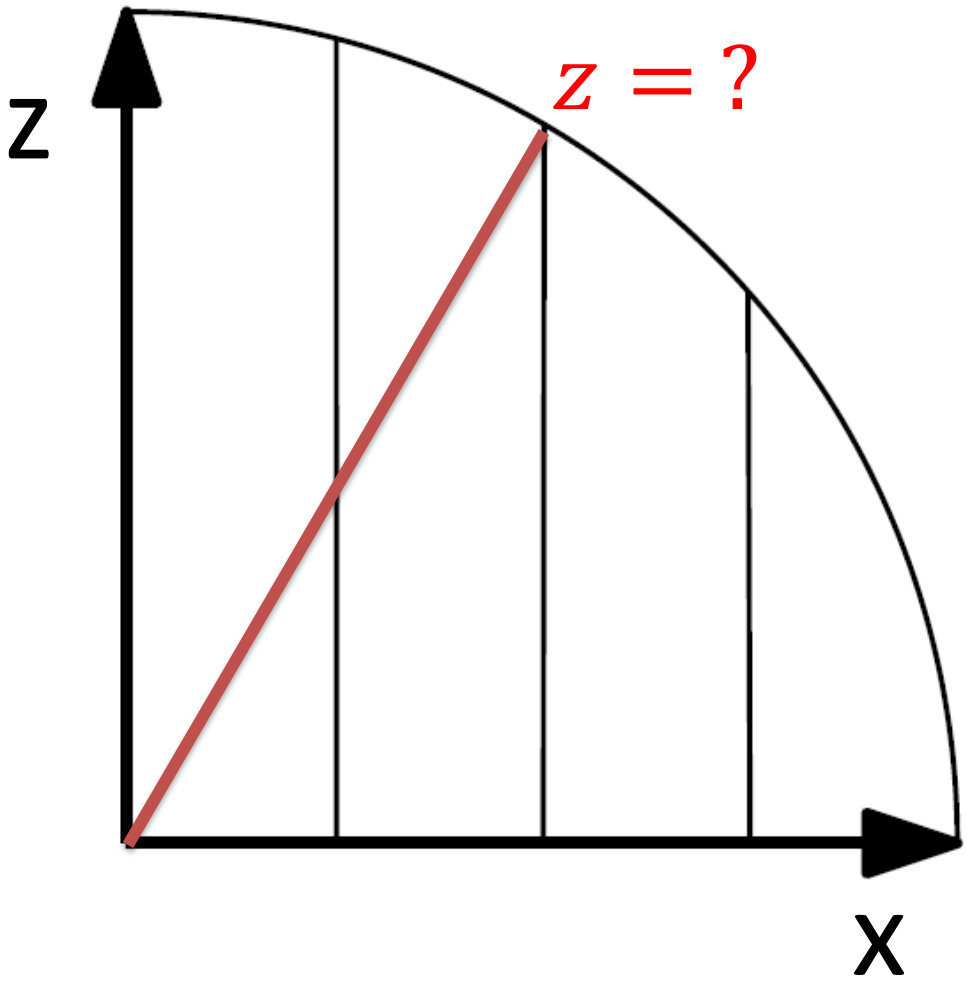
Example Depth Map



Sphere Shading



2D Circle Example

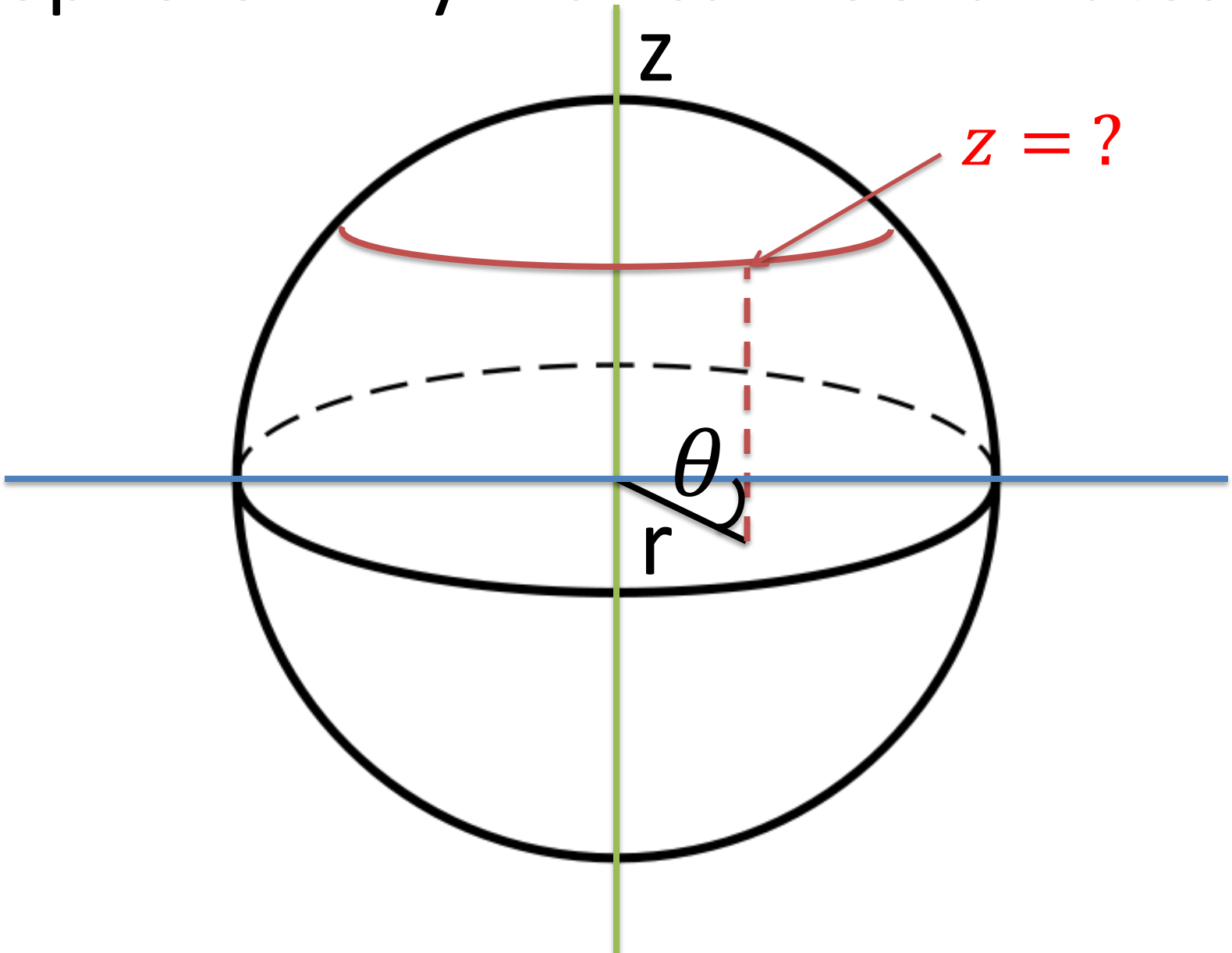


$$x^2 + z^2 = {r_C}^2$$

$$z^2 = r^2 - x^2$$

$$z = \sqrt{{r_C}^2 - x^2}$$

Sphere in Cylindrical Coordinates



Height Calculation Revisited

Sphere radius: r_S

z calculation in circle case: $z = \sqrt{{r_C}^2 - x^2}$

We want to calculate z which equals to z in cylindrical coordinates:

z depends only on r in cylindrical coordinates (θ can be ignored)

$$z = \sqrt{{r_S}^2 - r^2}$$

Calculation of r in cylindrical coordinates from Cartesian coordinates:

$$r = \sqrt{x^2 + y^2}$$

Thus: $$z = \sqrt{{r_S}^2 - x^2 - y^2}$$