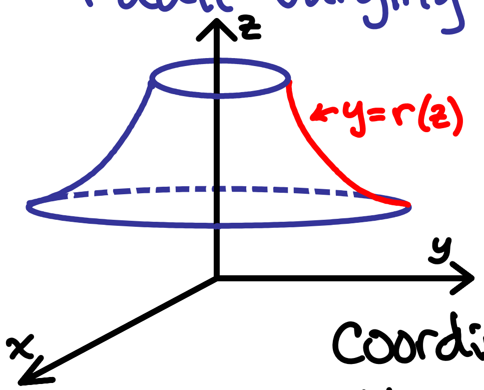
Calc D - Warm Up

Before cylindrical and spherical

Surfaces of Revolution - Equations

Consider the graph of the radius function $y=r(z)$ in the yz-plane. If you revolve this about the z-axis you see circles in the xy-plane with radii varying according to $r(z)$.



Circles: $x^2+y^2=[r(z)]^2$

If the graph of a radius function r is revolved about one of the coordinate axes, then the equation of the resulting surface has one of the following forms:

About x-axis: $y^2+z^2=[r(x)]^2$

y-axis: $x^2+z^2=[r(y)]^2$

z-axis: $x^2+y^2=[r(z)]^2$

Example: Curve $z^2=4y$, axis of rev.: y-axis

Step ① Need radius function in terms of

$z^2=4y \Rightarrow r(y)=z=\pm\sqrt{4y}$

② Apply revolution equation: $x^2+z^2=(r(y))^2$

$\therefore x^2+z^2=4y$ ← answer

non-rotation axis variables

Find the following surface equations.

Curve	Axis of Revol.
① $z=2y$	y-axis
② $z=2y$	z-axis
③ $2z=\sqrt{4-x^2}$	x-axis
④ $xy=2$	x-axis
⑤ $z=\ln y$	z-axis