Example Sketch (no restriction on u,v)

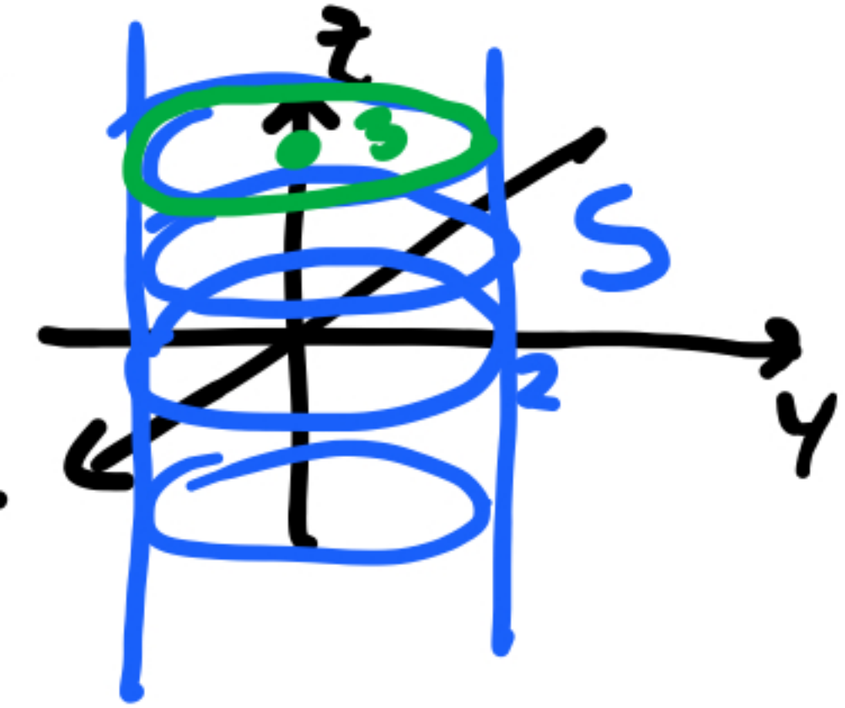
$$r(u,v) = 2\sin u\,\mathbf{i} + 2\cos u\,\mathbf{j} + 3v\,\mathbf{k}$$

$x = 2\sin u$

$y = 2\cos u$

$z = 3v$

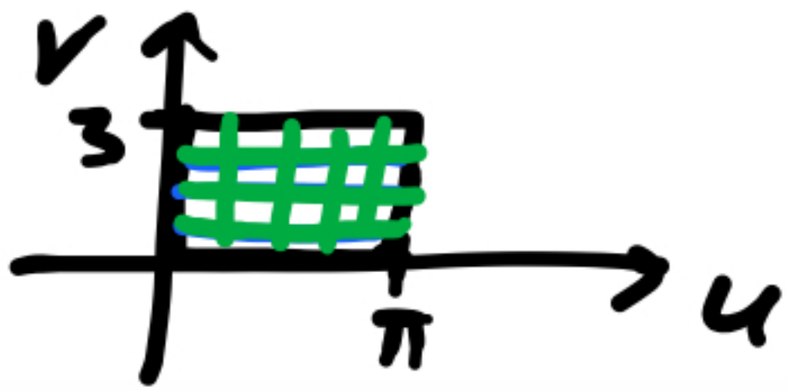
$x^2 + y^2 = 4$

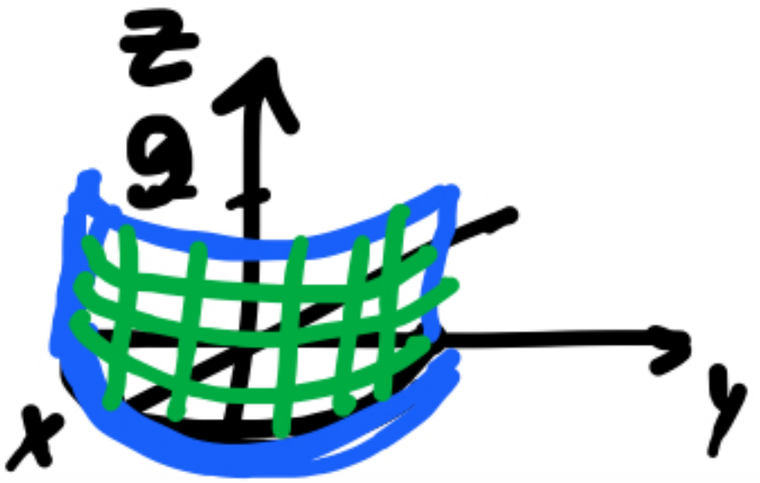


Now, restrict u,v:

$0 \le u \le \pi$

$0 \le v \le 3$





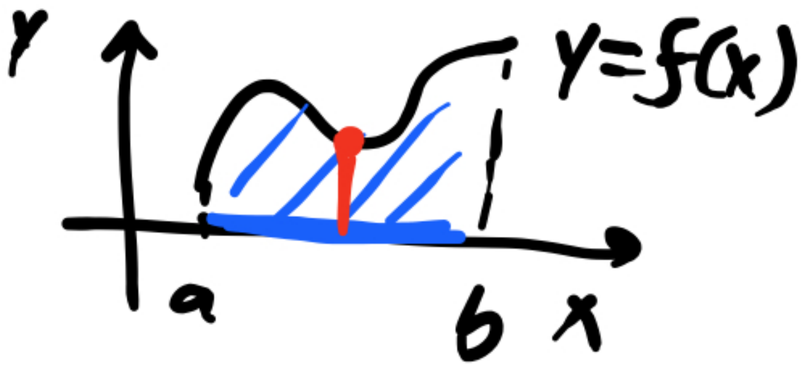
Important examples:

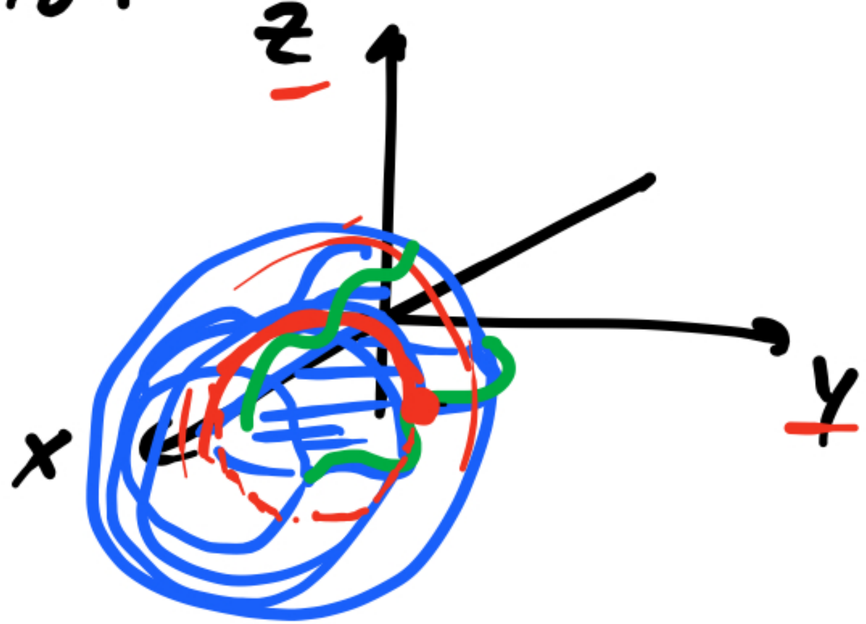
- sphere of radius $a > 0$:

$$x = a \sin\varphi \cos\theta \quad y = a \sin\varphi \sin\theta \quad z = a \cos\varphi$$

$$\varphi \in [0, \pi]$$
$$\theta \in [0, 2\pi].$$

- surface of revolution





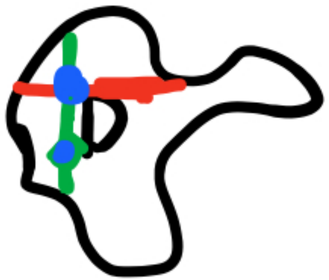
$x = x$

$y = f(x)\cos\theta$

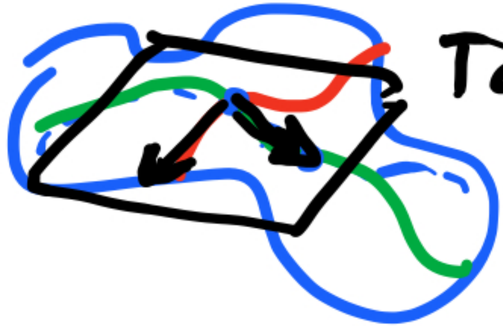
$z = f(x)\sin\theta$

$\theta \in [0, 2\pi)$.

Tangent plane



r



Tangent plane

r_v

r_u

⟶ area formula.