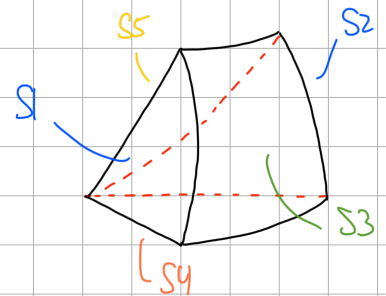


Elecong zfh 4
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 Matlab assignment 2

$$r=0 \quad \phi = \frac{\pi}{4} \quad \theta = \frac{\pi}{4}$$

$$r=z \quad \phi = \frac{\pi}{2} \quad \theta = \frac{\pi}{2}$$



a/ Determine the enclosed volume

$$V = \iiint_V dr d\phi d\theta = \iiint r^2 \sin\theta dr d\phi d\theta = \left[\int_0^z r^2 dr \right] \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin\theta d\theta \right] \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} d\phi \right] \dots$$

$$\dots = \left[\frac{z^3}{3} - \frac{0^3}{3} \right] \left[-\cos\left(\frac{\pi}{2}\right) + \cos\left(\frac{\pi}{4}\right) \right] \left[\frac{\pi}{2} - \frac{\pi}{4} \right] = \frac{2\pi}{3\sqrt{2}} \text{ m}^3 \approx 1.48 \text{ m}^3$$

b/ Determine The Total Surface Area

① Surface 1 & 2

$$SA = \iint dr d\theta = \iint r d\theta dr = \left[\int_0^z r dr \right] \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} d\theta \right] = \left[\frac{r^2}{2} \Big|_0^z \right] \left[\frac{\pi}{2} - \frac{\pi}{4} \right] = \frac{\pi}{2}$$

② Surface 3

$$SA = \iint d\phi d\theta = \iint r^2 \sin\theta d\phi d\theta = (z)^2 \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin\theta d\theta \right] \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} d\phi \right] = (4) \left(-\cos\theta \Big|_{\frac{\pi}{4}}^{\frac{\pi}{2}} \right) \left(\phi \Big|_{\frac{\pi}{4}}^{\frac{\pi}{2}} \right) = \frac{\pi}{\sqrt{2}}$$

③ Surface 4

$$SA = \iint dr d\phi = \iint r \sin\theta dr d\phi = \left[\sin\left(\frac{\pi}{2}\right) \right] \left[\int_0^z r dr \right] \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} d\phi \right] = \frac{\pi}{2}$$

④ Surface 5

$$SA = \iint dr d\phi = \iint r \sin\theta dr d\phi = \left[\sin\left(\frac{\pi}{4}\right) \right] \left[\int_0^z r dr \right] \left[\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} d\phi \right] = \frac{\pi}{2\sqrt{2}}$$

⑤ Total SA

$$SA_{\text{Total}} = S_1 + S_2 + S_3 + S_4 + S_5 = \frac{\pi}{2} + \frac{\pi}{2} + \frac{\pi}{\sqrt{2}} + \frac{\pi}{2} + \frac{\pi}{2\sqrt{2}} = 8.045 \text{ m}^2$$