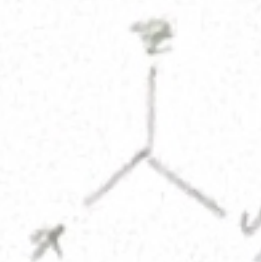


Section 15.8

$$2. a) \rho = \sqrt{1+z^2} = 2 \quad \cos \phi = \frac{z}{\rho} = 0 \quad \phi = \frac{\pi}{2} \quad \cos \theta = \frac{x}{\rho \sin \phi} = 0 \quad \theta = \frac{\pi}{2} \quad (2, 3\pi/2, \pi/2)$$



$$b) \rho = 2 \quad \cos \phi = \frac{\sqrt{2}}{2} \quad \phi = \frac{3\pi}{4} \quad \cos \theta = \frac{-1}{\sqrt{2}} \quad \theta = \frac{3\pi}{4} \quad (2, 3\pi/4, 3\pi/4)$$

7. plane of $z=1$

$$19. \int_0^2 \int_0^{\pi/2} \int_0^3 f(x,y,z) r dr d\theta dz$$

$$21. \int_0^5 \int_0^{\pi} \int_0^{2\pi} (\rho^2 \sin^2 \phi \cos^2 \theta + \rho^2 \sin^2 \phi \sin^2 \theta + \rho^2 \cos^2 \phi)^2 \rho^2 \sin \phi d\theta d\phi d\rho = \int_0^5 \rho^6 d\rho \int_0^{2\pi} d\theta \int_0^{\pi} \sin \phi d\phi \approx 140250$$

$$23. \int_2^3 \int_0^{\pi} \int_0^{2\pi} \rho^4 \sin^3 \phi d\theta d\phi d\rho = \int_2^3 \rho^4 d\rho \int_0^{2\pi} d\theta \int_0^{\pi} \sin^3 \phi d\phi = \frac{168\pi}{15}$$

Section 15.9

$$3. \begin{vmatrix} \cos t & -s \sin t \\ \sin t & s \cos t \end{vmatrix} = s$$

$$4. \begin{vmatrix} e^r & p e^r \\ q e^r & e^r \end{vmatrix} = e^{4r} (1 - pq)$$

$$7. v=0 \Rightarrow x=2y \quad v=2 \Rightarrow x=2u+6=2y+10 \\ u=0 \Rightarrow x=-3y \quad u=3 \Rightarrow x=6+3v=-15-3y$$

$$11. y=2x \pm 1 \quad x+y=1,3 \quad 3x=v-u \\ u=y-2x \quad v=x+y \quad x=\frac{1}{3}(v-u) \quad y=\frac{1}{3}(u+2v)$$

$$15. \begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix} = 3 \quad y=\frac{1}{2}x \quad u+2v=\frac{1}{2}(2u+v) \quad r=0 \quad y=2x \quad u+2v=2(2u+v) \quad u=0 \\ y=x+3 \quad u+2v=-2u+v+3 \quad u+v=3$$

$$\int_0^{1-u} \int_0^{1-u} (-4+5r) r dr du = 3 \int_0^1 (u-u^2 + \frac{5}{2}(1-u)^2) du = -3(\frac{1}{2} \cdot \frac{1}{3} + \frac{5}{6}) = -3$$

$$17. \begin{vmatrix} 2 & 0 \\ 0 & 3 \end{vmatrix} = 6 \quad x^2=4u^2 \quad y^2=9v^2 \quad 36(u^2+v^2)=36 \quad u^2+v^2=1 \quad \int_0^{2\pi} \int_0^1 4u^2 d\theta = 24 \quad \int_0^{2\pi} \cos^2 \theta d\theta \int_0^1 r^3 dr = 6\pi$$

$$23. u=x-2y \quad x=\frac{1}{3}(2v-u) \quad \begin{vmatrix} -1/3 & 2/3 \\ -2/3 & 1/3 \end{vmatrix} = 1/9 \quad \frac{1}{9} \int_0^4 \int_0^8 \frac{u}{v} dv du = \frac{8}{5} \log(8) \\ v=3x-y \quad y=\frac{1}{3}(v-3u)$$