17.3

1. $\operatorname{div}(F) = 0$

$\iiint 0 \, dV = 0$

3. $\operatorname{div}(F) = 2 + 0 + 0$

$\iiint 2 \, dV$

$\pi(2^2) = 4\pi$

$\frac{4\pi}{2} = 2\pi \qquad 2\pi \cdot \iiint 2 \, dV = 4\pi$

5. $\operatorname{div}(F) = 0 + 0 + z^2$ $\qquad x \leq 1 \quad y \leq 1 \quad z \leq 1$

$\iiint_K z^2 \, dV$

$\int_0^{2\pi} \int_0^{\pi} \int_0^{1} \rho^2 \cos^2\phi \cdot \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$

$\int_0^{2\pi} \int_0^{\pi} \frac{\rho^5}{5} \Big|_0^1 \cdot \cos^2\phi \cdot \sin\phi \, d\phi \, d\theta$

$\frac{1}{5} \int_0^{2\pi} -\frac{1}{3}\cos^3\phi \Big|_0^{\pi} d\theta$

$\frac{2}{15} \int_0^{2\pi} 1 \, d\theta$

$\frac{4\pi}{15}$

7. $div(F) = y^2+z^2+x^2 \quad 0 \le \theta \le 2\pi \quad 0 \le r \le 2 \quad 0 \le z \le 3$

$$\int_0^{2\pi}\int_0^2\int_0^3 z^2+r^2 \, r\,dz\,dr\,d\theta$$

$$\int_0^{2\pi}\int_0^2 \frac{z^3}{3}\cdot r + zr^3\Big|_0^3 dr\,d\theta$$

$$\int_0^{2\pi} \frac{9r^2}{2} + \frac{3r^4}{4}\Big|_0^2 d\theta$$

$$\int_0^{2\pi} 30\, d\theta$$

60π

11. $div(F) = 3x^2 + 3z^2$

$$3\int_0^{\pi/2}\int_0^{\pi/2}\int_0^2 \rho^2\sin^2\phi\cos^2\theta + \rho^2\cos\phi\,\rho^2\sin\phi\,d\rho\,d\phi\,d\theta$$

$$3\int_0^{\pi/2}\int_0^{\pi/2} \frac{\rho^5}{5}\Big|_0^2 \sin^3\phi\cos^2\theta + \sin\phi^2\cos\theta\,d\phi\,d\theta$$

$$\frac{96}{5}\int_0^{\pi/2} \sin^4\phi\cdot\frac{1}{4\cos\phi}\cos^2\theta - \cos\phi\cos\phi\Big|_0^{\pi/2} d\theta$$

$$\frac{96}{5}\int_0^{\pi/2} (0\cos^2\theta - 0\cos\theta) - (0 - 1\cos\theta)\,d\theta$$

$$\frac{96}{5}\left(\frac{\pi}{2} - 0\right) = \frac{32\pi}{5}$$

15. $div(F) = 1 + 0 + 1$

$\iiint 2\,dV$

Volume of paraboloid

$9^2 \cdot \frac{1}{2} \cdot \iiint 2\,dV = 81\pi$