15.3

3. $f(x,y,z) = xe^{y-2z}$; $0 \le x \le 2$, $0 \le y \le 1$, $0 \le z \le 1$

$$\int_0^2\int_0^1\int_0^1 xe^{y-2z}\,dz\,dy\,dx = e - \frac{1}{e}$$

5. $f(x,y,z) = (x-y)(y-z)$; $[0,1] \times [0,3] \times [0,3] = \int_0^3\int_0^3\int_0^1 (xy - xz - y^2 + yz)\,dx\,dy\,dz = \boxed{\frac{-27}{4}}$

7. $f(x,y,z) = (x+z)^3$; $[0,a] \times [0,b] \times [0,c] = \int_0^c\int_0^b\int_0^a (x+z)^3\,dx\,dy\,dz = \boxed{\frac{(a+c)^5 b - c^5 b - a^5 b}{20}}$

11. $f(x,y,z) = xyz$; $W: 0 \le z \le 1$, $0 \le y \le \sqrt{1-x^2}$, $0 \le x \le 1$: $\int_0^1\int_0^{\sqrt{1-x^2}} \frac{xy}{2}\,dy\,dx = \boxed{\frac{1}{16}}$

13. $f(x,y,z) = e^z$; $W: x+y+z \le 1$, $x \ge 0$, $y \ge 0$, $z \ge 0$: $\int_0^1\int_0^{y-1} e^{1-x-y} - 1\,dx\,dy = \boxed{e - 5/2}$

15. $\int_0^1\int_0^x \frac{9-\cancel{x}-y^2}{2}\,dy\,dx = \boxed{25/12}$

17. $f(x,y,z) = x$ over region in first octant $(x \ge 0, y \ge 0, z \ge 0)$ above $z = y^2$ below $z = 4 - 2x - y^2$

15.4

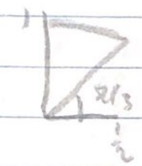
1. $f(x,y) = \sqrt{x^2+y^2}$, $x^2+y^2 \le 2$ $\quad r: [0, \sqrt{2}]$ $\quad \theta: [0, 2\pi]$

$$\int_0^{2\pi}\int_0^{\sqrt{2}} r\,dr\,d\theta = \boxed{\frac{4\sqrt{2}\pi}{3}}$$

5. $f(x,y) = y(x^2+y^2)^{-1}$; $y \ge \frac{1}{2}$, $x^2+y^2 \le 1$ $\quad \theta: [\pi/6, 5\pi/6]$ $\quad r: \left[\frac{\csc\theta}{2}, 1\right]$

$$= \boxed{\sqrt{3} - \pi/3}$$

9. $$\int_0^{1/2}\int_{\sqrt{3}x}^{\sqrt{1-x^2}} x\,dy\,dx$$



$$\int_{\pi/3}^{\pi/2}\int_0^1 r^2\cos\theta\,dr\,d\theta = 0.045$$

19. $f(x,y) = x-y$; $x^2+y^2 \le 1$, $x+y \ge 1$: $\quad 0 \le \theta \le \pi/2$, $\quad \frac{1}{\cos\theta+\sin\theta} \le r \le 1$

$$\int_0^{\pi/2}\int_{\frac{1}{\cos\theta+\sin\theta}}^{1} r(\cos\theta - \sin\theta)\,r\,dr\,d\theta = 0$$

27. $f(x,y,z) = x^2+y^2$; $x^2+y^2 \le 9$, $0 \le z \le 5$: $\quad \int_0^5\int_0^{2\pi}\int_0^3 r^3\,dr\,d\theta\,dz = \boxed{\frac{405\pi}{2}}$

31. $f(x,y,z) = z$; $x^2+y^2 \le z \le 9$ $\quad = 243\pi$

47. $f(x,y,z) = x^2+y^2$; $\rho \le 1$: $\quad \int_0^{2\pi}\int_0^{\pi}\int_0^1 (\rho^2\sin^2\varphi)\,\rho^2\sin\varphi\,d\rho\,d\varphi\,d\theta = \boxed{\frac{8\pi}{15}}$

51. $f(x,y,z) = z$, $0 \le \theta \le \pi/3$, $0 \le \varphi \le \pi/2$, $1 \le \rho \le 2$ $\quad = \boxed{5\pi/8}$