Math 251 Shaun Goda Section 23 HW #7

January February March April May June July August September October November December
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

15.1

9) $\int_0^3 \int_0^5 (15-3x)\,dx\,dy \Rightarrow \left| 15x - \frac{3x^2}{2} \right|_2^5 = \frac{75}{2}$

$\int_0^3 \frac{75}{2}\,dy = \left| \frac{75}{2}y \right|_0^3 = \boxed{\frac{225}{2}}$

15) $\int_0^5 \int_{-4}^4 (x^3)\,dx\,dy \Rightarrow \left| \frac{x^4}{4} \right|_{-4}^4 = 0$ Integral of 0 is 0

answer is $\boxed{0}$

21) $\int_4^9 \int_{-3}^8 1\,dx\,dy \Rightarrow |x|_{-3}^8 = 11$ $\int_4^9 11\,dy = \boxed{55}$

23) $\int_{-1}^1 \int_0^\pi x^2 \sin y\,dy\,dx \Rightarrow \left| -x^2\cos y \right|_0^\pi = 2x^2$

$\int_{-1}^1 2x^2\,dx = \left| \frac{2x^3}{3} \right|_{-1}^1 = \left(\frac{2}{3}\right) + \left(\frac{2}{3}\right) = \boxed{\frac{4}{3}}$

25) $\int_2^6 \int_1^4 x^2\,dx\,dy \Rightarrow \left| \frac{x^3}{3} \right|_1^4 = \left(\frac{64}{3}\right) - \left(\frac{1}{3}\right) = \left(\frac{63}{3}\right) = 21$

$\int_2^6 21\,dy = \left| 21y \right|_2^6 = 126 - 42 = \boxed{84}$

31) $\int_1^2 \int_0^4 \frac{1}{x+y}\,dy\,dx \Rightarrow \left| \ln(x+y) \right|_0^4 = \ln(x+4) - \ln(x) = \ln\left(\frac{|x+4|}{|x|}\right)$

$\int_1^2 \ln\left(\frac{|x+4|}{|x|}\right)dx = \left| x\ln\left(\frac{x+4}{x}\right) + 4\ln(x+4) \right|_1^2$

$= \boxed{\ln\left(\frac{11664}{3125}\right) \approx 1.317}$

35) $\int_1^2 \int_1^3 \frac{\ln(xy)}{y}\,dy\,dx \Rightarrow \int_1^3 u\,du = \left| \ln(xy) \right|_1^3 = \ln(xy)\ln(3)$

$u = \ln(xy)$
$du = \frac{1}{y}\,dy$

$\int_1^2 \ln(xy)\ln(3)\,dx = \left| \ln(xy)\ln(3)x \right|_1^2$

$= \boxed{\ln(xy)\cdot\ln(3)}$

37) $\int_1^3 \int_{-2}^4 \frac{x}{y}\,dx\,dy \Rightarrow \left|\frac{x^2}{2y}\right|_{-2}^{4} = \frac{8}{y} - \frac{2}{y} = \frac{6}{y}$

$\int_1^3 \frac{6}{y}\,dy = \left|6\ln(y)\right|_1^3 = 6\ln 3 - 6\ln 1 \approx \boxed{6.592}$

41) $\int_0^{\frac{\pi}{4}} \int_0^2 (e^x \sin y)\,dx\,dy \Rightarrow \left|e^x \sin y\right|_0^2 = e^2 \sin y - \sin y$

$\int_0^{\frac{\pi}{4}} (e^2 \sin y - \sin y)\,dy = \left|-e^2 \cos y + \cos y\right|_0^{\frac{\pi}{4}}$

$= \left(-e^2 \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\right) - \left(-e^2 + 1\right) \approx \boxed{1.871}$

15.2:

3) Vertically simple region: $0 \le x \le 1$, $0 \le y \le 1 - x^2$

Horizontally simple region: $0 \le y \le 1$, $0 \le x \le \sqrt{1-y}$

$\int_0^1 \left(\int_0^{1-x^2} (xy)\,dy \right) dx = \left| \frac{xy^2}{2} \right|_0^{1-x^2} = -xyx^2$

$\int_0^1 -xyx^2\,dx = \boxed{\frac{-xy}{3}}$

5) $\int_0^2 \int_{-2y+4}^4 (x^2 y)\,dx\,dy \Rightarrow \left|\frac{x^3 y}{3}\right|_{-2y+4}^4 = \left(\frac{64y}{3}\right) - \left(\frac{(-2y+4)^3 y}{3}\right)$

$= (8y^2(y^2 - 6y + 12))/3$

$\int_0^2 (8y^2(y^2 - 6y + 12))/3\,dy = \frac{192}{5} \approx \boxed{38.4}$

6) $\int_0^2 \int_{2y}^4 (x^2 y)\,dx\,dy = \frac{128}{5} \approx \boxed{25.6}$

7) $\int_0^2 \int_y^4 (x^2 y)\,dx\,dy = \frac{608}{15} \approx \boxed{40.53}$

11) $\int_0^{\sqrt{4-1^2}} \int_1^{\sqrt{4-y^2}} \frac{y}{x}\,dx\,dy = 2\ln(2) - \frac{3}{4} \approx \boxed{0.636}$

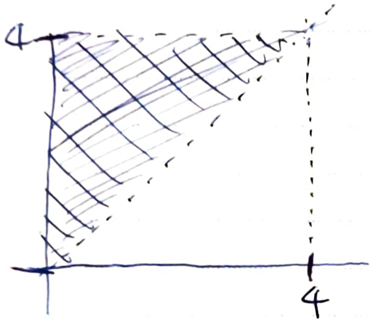
19) $\int_0^1 \int_1^{e^{x^2}} x \, dy \, dx \Rightarrow \left| xy \right|_1^{e^{x^2}} = xe^{x^2} - x$

$$\int_0^1 (xe^{x^2} - x)\, dx = \left| \frac{e^{x^2}}{2} - \frac{x^2}{2} \right|_0^1$$

$$= \left(\frac{e}{2} - \frac{1}{2}\right) - \left(\frac{1}{2}\right) = \frac{e}{2} - 1 \approx \boxed{0.359}$$

21) $\int_0^1 \int_0^y 2xy \, dx \, dy - \int_0^1 \int_0^{y^2} 2xy \, dx \, dy = \boxed{\frac{1}{12}}$

use evalf on maple.

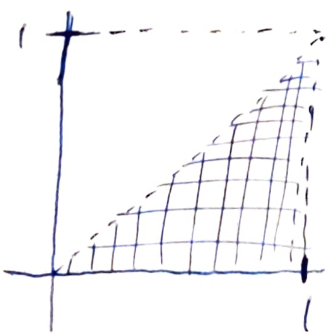
25) 

$$\int_0^4 \int_0^y f(x,y) \, dx \, dy$$

31) Range of $x \Rightarrow 0 \le x \le 1$
Range of $y \Rightarrow 1 \le y \le e$
Must be integrated with dy first

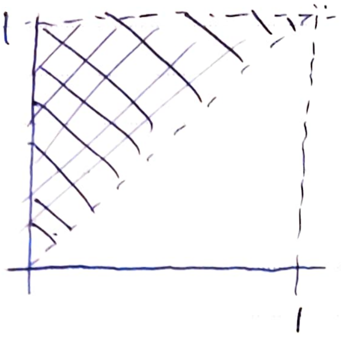
$$\int_0^1 \int_{e^x}^{e} \frac{1}{\ln y} \, dy \, dx - \int_0^1 \int_{e^{\sqrt{x}}}^{e} \frac{1}{\ln y} \, dy \, dx$$

$$= (e-1) - (1) = e - 2 \approx \boxed{0.718}$$

33) 

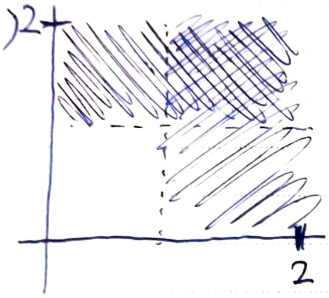
$$\int_0^1 \int_0^y \frac{\sin x}{x} \, dx \, dy \approx \boxed{0.4863}$$

35)



$$\int_0^1 \int_0^y x e^{y^3}\,dx\,dy = \frac{e-1}{6} \approx \boxed{0.286}$$

37)



$$\int_0^2 \int_0^2 e^{x+y}\,dx\,dy - \int_0^1 \int_0^1 e^{x+y}\,dx\,dy$$

$$= (e^2-1)^2 - (e-1)^2$$

$$= e^4 - 3e^2 + 2e \approx \boxed{37.868}$$

43) $$\int_1^2 \int_y^{2y} \frac{\sin y}{y}\,dx\,dy = -\cos(2) + \cos(1) \approx \boxed{0.956}$$

49) $-z - x^2 - y^2 = -8$ $\quad y = \sqrt{z - x^2}$

$- \quad -z + x^2 + y^2 = 0$

$-2x^2 - 2y^2 = -8$

I don't know how to solve this problem...