15.3 Hw hints

#4 Answer is 6

#9 Hint: $\int x \sin(x) \, dx$ — Integrate by parts.

#12 Integrate with respect to x first; answer is $\frac{1}{12}$.

#14 Answer is $3/10$

#15 Easiest as Type II; $2-y \le x \le 2y-1$, $1 \le y \le 2$

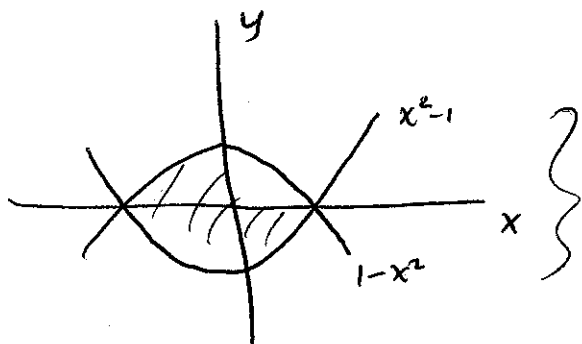#20 Do as Type II, $y^3 \le x \le y^2$ (Answer: $19/210 \approx 0.09$)

#22 Not bad either as I or II; $V = 5/6$

#25 Type I: $x^2 \le y \le 4$, $-2 \le x \le 2$

#26 (Started in class) Must do as

$$\int_0^2 \int_0^{2y} \sqrt{4-y^2} \, dx \, dy = \cdots = \frac{16}{3}$$

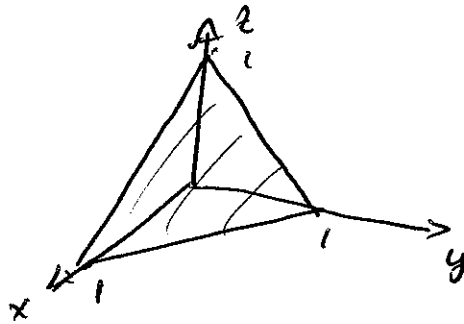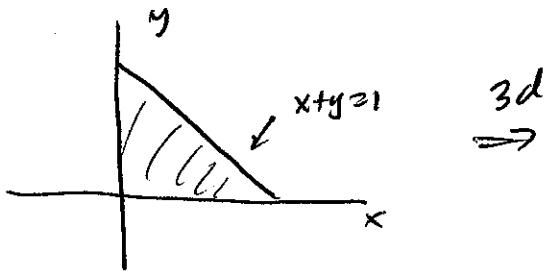#31 In the xy-plane, we have $y = 1-x^2$ and $y = x^2-1$
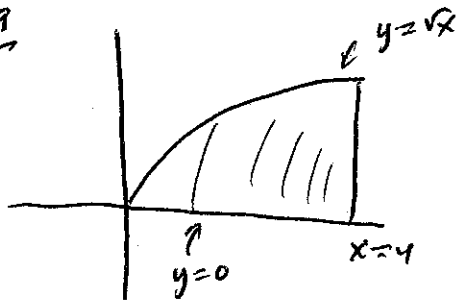

Above this region in the z-direction, the plane $z = 2x+2y+10$ is above the plane $z = 2-x-y$.

We could compute the volume directly by taking the volume under the higher plane & subtracting the volume under the lower plane.

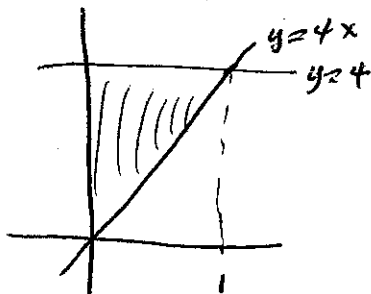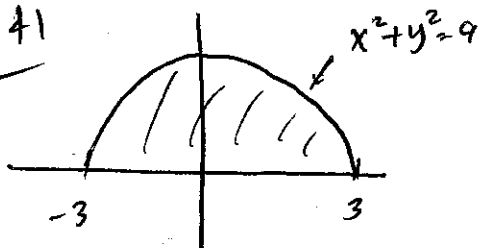**#33** In the xy-plane, the region is:

$x+y=1$
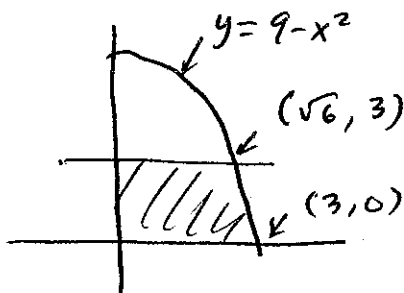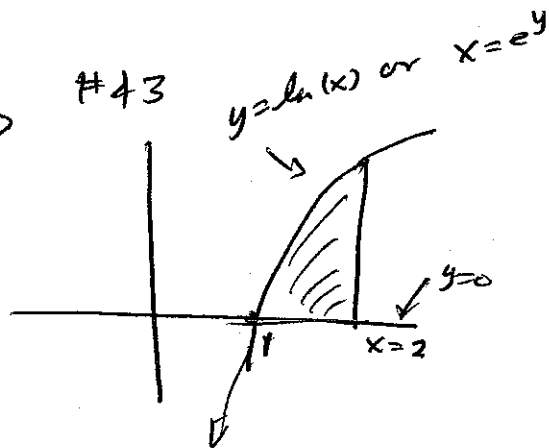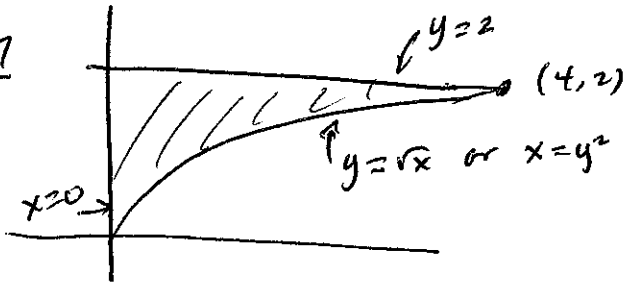
$3d$
$\Rightarrow$

#39

$y=\sqrt{x}$

$y=0$

$x=4$

#40

$y=4x$

$y=4$

1

#41

$x^2+y^2=9$

-3 3

#42

$y=9-x^2$

$(\sqrt{6}, 3)$

$(3,0)$

#43 $y=\ln(x)$ or $x=e^y$

$y=0$

$x=2$

#47

$y=2$

$(4,2)$

$y=\sqrt{x}$ or $x=y^2$

$x=0$

$$\int_0^2 \int_0^{y^2} \frac{1}{y^3+1}\, dx\, dy = \int_0^2 \frac{y^2}{y^3+1}\, dy \quad (u, du)$$

#49

$y=\sin(x)$

$y=1$

$\frac{\pi}{2}$

$$\int_0^{\pi/2} \int_0^{\sin(x)} \cos x \sqrt{1+\cos^2 x}\, dy\, dx$$

$$=\ldots = \int_0^{\pi/2} \cos(x)\sqrt{1+\cos^2 x}\, \underline{\underline{\sin x\, dx}}$$

$u = \cos x$

$du = -\sin x\, dx$

etc.

#51. (Sum 4 of them)

#52 (Break into 2)

#53 (Look at Prop. 11, but you can skip this one).

#55 The area of the triangle is $3/2$, so the avg value:

$$f_{avg} = \frac{1}{3/2}\iint_\Delta xy\, dy\, dx = \frac{2}{3}\int_0^1 \int_0^{3x} xy\, dy\, dx = \ldots$$

#61 See item 2 in the group work.