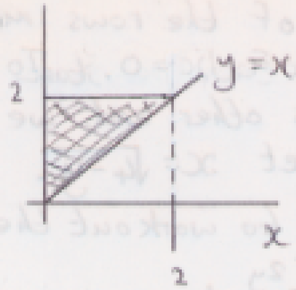


The rows run from $y=x$ to $y=2$. as is indicated by the limits of the inner integral.
Reversing the order gives us rows running in the x-direction from $x=0$ to $x=y$.
So the new integral looks like $\int_0^2\int_0^y 2y^2\sin xy\,dx\,dy$

$$\int_0^2\int_0^y 2y^2\sin xy\,dx\,dy = \int_0^2\left[2y^2\left(\frac{-\cos xy}{y}\right)\right]_0^y dy$$

$= \int_0^2 (-2y\cos y^2 + 2y)\,dy$ using the substitution $u=y^2$, on the first term, gives

$\frac{du}{dy}=2y$, $dy=\frac{du}{2y}$. For the limits, when $y=0$, $u=0$ and when $y=2$, $u=4$. we rephrase the integral as $\int_0^4 -2y\cos u\frac{du}{2y} = \int_0^4 -\cos u\,du = [-\sin u]_0^4$

$= -\sin 4$.

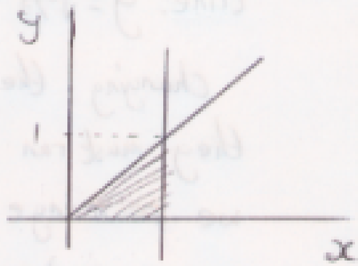
The second term, we can integrate conventionally, $\int_0^2 2y\,dy$
$= [y^2]_0^2 = 4$.

Adding the two terms together gives $4-\sin 4$.

3) $\int_0^1\int_y^1 x^2e^{xy}\,dx\,dy$

<u>Solution</u>

Here, the rows run in the x-direction from the line $x=y$ up to the line $x=1$.



Swapping the direction, we have that the rows run in the y-direction from $y=0$ to the line $y=x$. x then runs from 0 to 1.

$$\int_0^1\int_0^x x^2e^{xy}\,dy\,dx = \int_0^1\left[xe^{xy}\right]_0^x dx = \int_0^1 xe^{x^2}dx$$

$= \left[\tfrac{1}{2}e^{x^2}\right]_0^1 = \tfrac{1}{2}(e-1)$

4) $\int_0^2\int_0^{4-x^2}\frac{xe^{2y}}{4-y}\,dy\,dx$

<u>Solution</u>

The rows of infinitely thin columns run in the y-direction, from $y=0$ upto the line $y=4-x^2$.