Boas

5-2. 1. Since the limits are constant [integral over a rectangle -- see text equation (2.8)], we may evaluate the double integral as a product of two single integrals:

$$\left(\int_0^1 3x\,dx\right)\left(\int_2^4 dy\right) = \left(\frac{3x^2}{2}\Big|_0^1\right)\left(y\Big|_2^4\right) = \frac{3}{2}(4-2) = 3.$$

5-2. 5. We first evaluate the y integral:

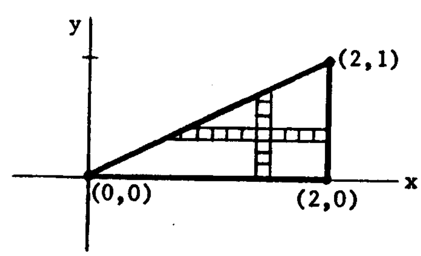
$$\int_{y=x}^{e^x} y\,dy = \frac{y^2}{2}\Big|_x^{e^x} = \frac{1}{2}(e^{2x} - x^2).$$

Then we integrate this result with respect to x:

$$\frac{1}{2}\int_0^1 (e^{2x} - x^2)\,dx = \frac{1}{2}\left(\frac{e^{2x}}{2} - \frac{x^3}{3}\right)\Big|_0^1 = \frac{1}{4}(e^2 - e^0) - \frac{1}{6}(1-0)$$

$$= \frac{e^2}{4} - \frac{5}{12}\,.$$

7. Compare the given area with text Figure 2.7; we may integrate in either order. The equation of the slanted line is $y = x/2$ or $x = 2y$. Thus we find



$$\int_{x=0}^{2}\int_{y=0}^{x/2} (2x - 3y)\,dy\,dx = \int_{x=0}^{2}\left(2xy - \frac{3y^2}{2}\Big|_{y=0}^{x/2}\right)dx = \int_0^2 \left(\frac{5x^2}{8}\right)dx = \frac{5x^3}{24}\Big|_0^2 = \frac{5}{3}$$

or

$$\int_{y=0}^{1}\int_{x=2y}^{2} (2x - 3y)\,dx\,dy = \int_{y=0}^{1}\left(x^2 - 3xy\Big|_{x=2y}^{2}\right)dy = \int_0^1 (4 - 6y + 2y^2)\,dy = \frac{5}{3}$$