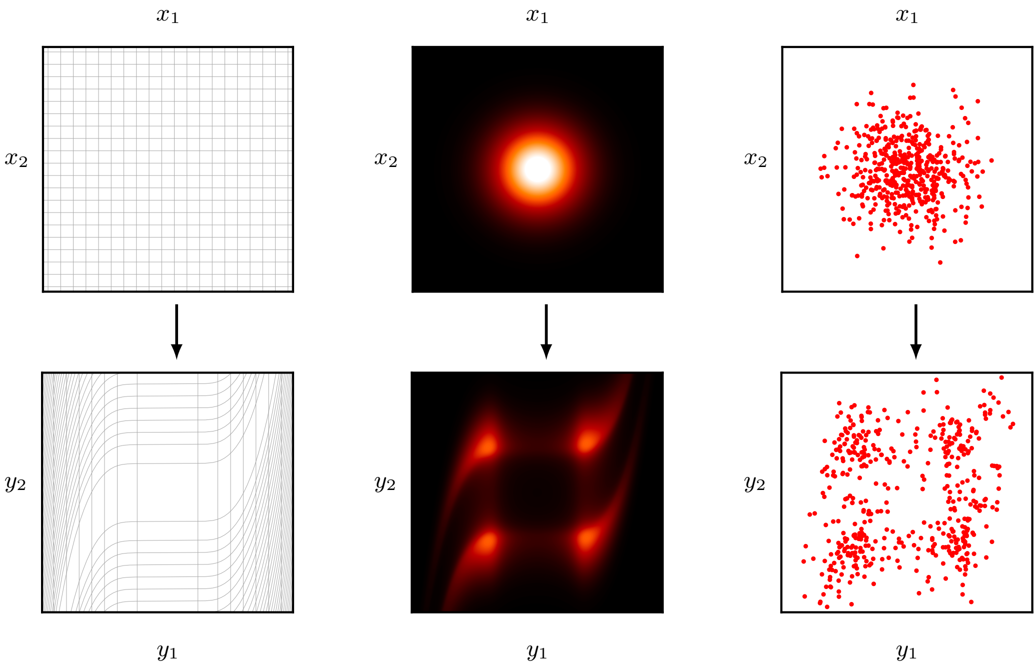

Figure 2.13 Illustration of the effect of a change of variables on a probability distribution in two dimensions. The left column shows the transforming of the variables whereas the middle and right columns show the corresponding effects on a Gaussian distribution and on samples from that distribution, respectively.

that arises when changing variables within an integral. The formula (2.77) follows from the fact that the probability mass in region $\Delta\mathbf{x}$ is the same as the probability mass in $\Delta\mathbf{y}$. Once again, we take the modulus to ensure that the density is non-negative.

We can illustrate this by applying a change of variables to a Gaussian distribution in two dimensions, as shown in the top row in Figure 2.13. Here the transformation from $\mathbf{x}$ to $\mathbf{y}$ is given by

Exercise 2.20

$$y_1 = x_1 + \tanh(5x_1) \tag{2.78}$$

$$y_2 = x_2 + \tanh(5x_2) + \frac{x_1^3}{3}. \tag{2.79}$$

Also shown on the bottom row are samples from a Gaussian distribution in $\mathbf{x}$-space along with the corresponding transformed samples in $\mathbf{y}$-space.