



**Figure 3.5.** Bivariate Normal Distribution Function. The parameters are  $\mu_X = 0$ ,  $\mu_Y = 0$ ,  $\sigma_X^2 = 1$ ,  $\sigma_Y^2 = 1$ , and  $\rho = 0.5$ . Panel (a) is a perspective plot of  $f_{X,Y}(x,y)$ . Panel (b) is a contour plot of  $f_{X,Y}(x,y)$ . The lines shown in Panel (b) are  $\mathcal{E}(Y|X)(x)$  (center),  $\mathcal{E}(Y|X)(x)$  plus one standard deviation of  $f_{Y|X}(y|x)$  (top), and  $\mathcal{E}(Y|X)(x)$  minus one standard deviation of  $f_{Y|X}(y|x)$  (bottom). Panel (c) is a plot of  $f_Y(y)$ . Panel (d) is a plot of  $f_X(x)$ .