The usual image of a saddle point is that of a mountain pass (or a horse saddle), where you can walk upward in some directions and downward in other directions. The definition of a saddle point we have given includes other less common situations. For example, with this definition, the cylinder $z = x^2$ has a line of saddle points along the y-axis.

The hyperbolic paraboloid $z = x^2 - y^2$ has a saddle point at $(0, 0)$.

Saddle points at $(0, -3)$, $(0, 0)$, $(2, -3)$, and $(2, 0)$

One local maximum surrounded by four saddle points.

Local maximum at $(1, -2)$

$z = xy(x - 2)(y + 3)$

FIGURE 12.87

FIGURE 12.86

FIGURE 12.88 (a)

FIGURE 12.88 (b)