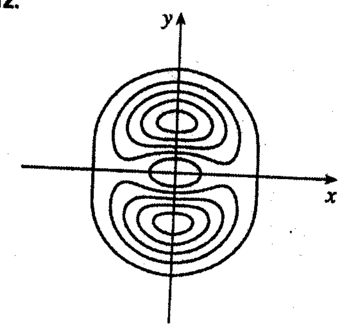
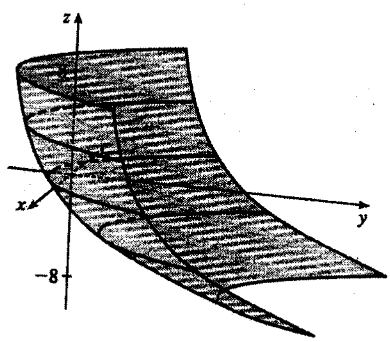
9. The point $(-3, 3)$ lies between the level curves with z-values 50 and 60. Since the point is a little closer to the level curve with $z = 60$, we estimate that $f(-3, 3) \approx 56$. The point $(3, -2)$ appears to be just about halfway between the level curves with z-values 30 and 40, so we estimate $f(3, -2) \approx 35$. The graph rises as we approach the origin, gradually from above, steeply from below.

10. If we start at ... contour map II the cone.

12.

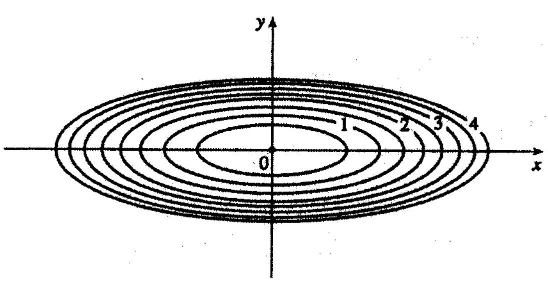


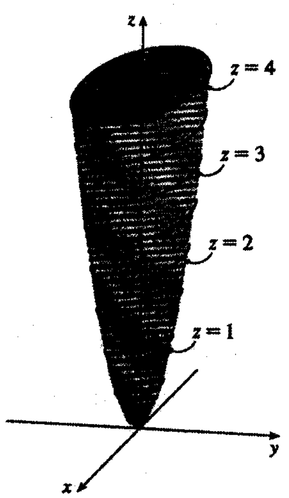
14.



23. The contour map consists of the level curves $k = x^2 + 9y^2$, a family of ellipses with major axis the x-axis. (Or, if $k = 0$, the origin.)

The graph of $f(x, y)$ is the surface $z = x^2 + 9y^2$, an elliptic paraboloid.

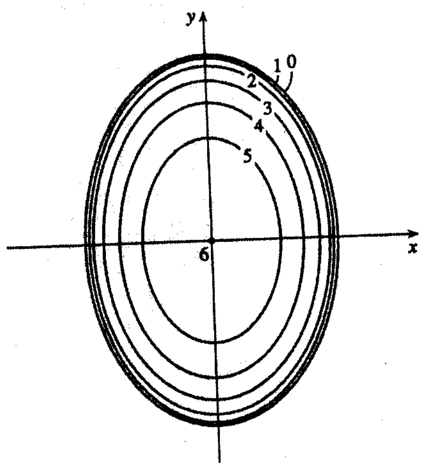


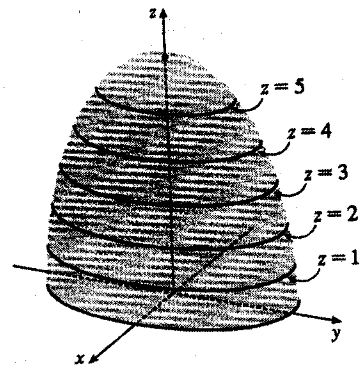


If we visualize lifting each ellipse $k = x^2 + 9y^2$ of the contour map to the plane $z = k$, we have horizontal traces that indicate the shape of the graph of f.

24. The contour map consists of the level curves $k = \sqrt{36 - 9x^2 - 4y^2} \Rightarrow 9x^2 + 4y^2 = 36 - k^2$, $k \geq 0$, a family of ellipses with major axis the y-axis. (Or, if $k = 6$, the origin.)

The graph of $f(x, y)$ is the surface $z = \sqrt{36 - 9x^2 - 4y^2}$, or equivalently the upper half of the ellipsoid $9x^2 + 4y^2 + z^2 = 36$.





If we visualize lifting each ellipse $k = \sqrt{36 - 9x^2 - 4y^2}$ of the contour map to the plane $z = k$, we have horizontal traces that indicate the shape of the graph of f.

(a) B *Reasons:* This function is constant on any circle centered at the origin, a description which matches
(b) III only B and III.

32. (a) C *Reasons:* This function is the same if x is interchanged with y, so its graph is symmetric about the plane $x = y$. Also, $z(0, 0) = 0$ and the values of z approach 0 as we use points farther from the origin. These conditions are satisfied only by C and II.
(b) II

33. (a) F *Reasons:* z increases without bound as we use points closer to the origin, a condition satisfied only by F and V.
(b) V

34. (a) A *Reasons:* Along the lines $y = \pm\frac{1}{\sqrt{3}}x$ and $x = 0$, this function is 0.
(b) VI

35. (a) D *Reasons:* This function is periodic in both x and y, with period 2π in each variable.
(b) IV

36. (a) E *Reasons:* This function is periodic along the x-axis, and increases as $|y|$ increases.
(b) I