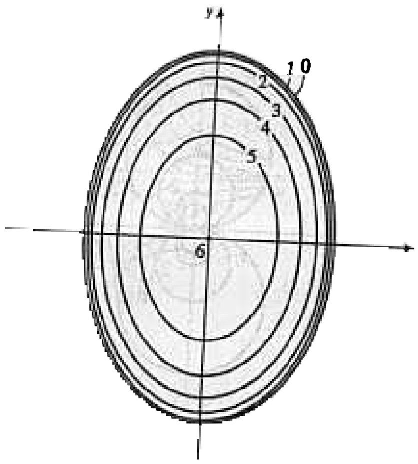
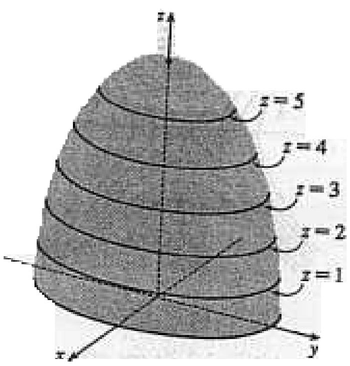
24. The contour map consists of the level curves $k = \sqrt{36 - 9x^2 - 4y^2} \Rightarrow 9x^2 + 4y^2 = 36 - k^2$, $k \geq 0$, a family of ellipses with major axis the y-axis. (Or, if $k = 6$, the origin.)

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





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

14. $f(x, y) = \dfrac{xy - 2y}{x^2 + y^2 - 4x + 4} = \dfrac{y(x-2)}{y^2 + (x-2)^2}$. Then $f(x, 0) = 0$ for $x \neq 2$, so $f(x, y) \to 0$ as $(x, y) \to (2, 0)$ along the x-axis. But $f(x, x-2) = \dfrac{(x-2)(x-2)}{(x-2)^2 + (x-2)^2} = \dfrac{(x-2)^2}{2(x-2)^2} = \dfrac{1}{2}$ for $x \neq 2$, so $f(x, y) \to \frac{1}{2}$ as $(x, y) \to (2, 0)$ along the line $y = x - 2$ $(x \neq 2)$. Thus, the limit doesn't exist.

28. $G(x, y) = g(f(x, y))$ where $f(x, y) = x^2 + y^2$, continuous on $\mathbb{R}^2$, and $g(t) = \sin^{-1} t$, continuous on its domain $\{t \mid -1 \leq t \leq 1\}$. Thus G is continuous on its domain $D = \{(x, y) \mid -1 \leq x^2 + y^2 \leq 1\} = \{(x, y) \mid x^2 + y^2 \leq 1\}$, inside and on the circle $x^2 + y^2 = 1$.

34. $\displaystyle\lim_{(x,y)\to(0,0)} (x^2 + y^2)\ln(x^2 + y^2) = \lim_{r\to 0^+} r^2 \ln r^2 = \lim_{r\to 0^+} \frac{\ln r^2}{1/r^2} = \lim_{r\to 0^+} \frac{(1/r^2)(2r)}{-2/r^3}$ (using l'Hospital's Rule) $\displaystyle = \lim_{r\to 0^+} (-r^2) = 0$