22. If we start at the origin and move along the $x$-axis, for example, the $z$-values of a cone centered at the origin increase at a constant rate, so we would expect its level curves to be equally spaced. A paraboloid with vertex the origin, on the other hand, has $z$-values which change slowly near the origin and more quickly as we move farther away. Thus, we would expect its level curves near the origin to be spaced more widely apart than those farther from the origin. Therefore contour map I must correspond to the paraboloid, and contour map II the cone.

24. 

25. The level curves are $(y - 2x)^2 = k$ or $y = 2x \pm \sqrt{k}$, $k \geq 0$, a family of pairs of parallel lines.

26. The level curves are $x^3 - y = k$ or $y = x^3 - k$, a family of cubic curves.

41. $z = \sin(xy)$ (a) C (b) II

Reasons: This function is periodic in both $x$ and $y$, and the function is the same when $x$ is interchanged with $y$, so its graph is symmetric about the plane $y = x$. In addition, the function is 0 along the $x$- and $y$-axes. These conditions are satisfied only by C and II.
42. $z = e^x \cos y$  
   (a) A  
   (b) IV  
   Reasons: This function is periodic in $y$ but not $x$, a condition satisfied only by A and IV. Also, note that traces in $x = k$ are cosine curves with amplitude that increases as $x$ increases.

43. $z = \sin(x - y)$  
   (a) F  
   (b) I  
   Reasons: This function is periodic in both $x$ and $y$ but is constant along the lines $y = x + k$, a condition satisfied only by F and I.

44. $z = \sin x - \sin y$  
   (a) E  
   (b) III  
   Reasons: This function is periodic in both $x$ and $y$, but unlike the function in Exercise 61, it is not constant along lines such as $y = x + \pi$, so the contour map is III. Also notice that traces in $y = k$ are vertically shifted copies of the sine wave $z = \sin x$, so the graph must be E.

45. $z = (1 - x^2)(1 - y^2)$  
   (a) B  
   (b) VI  
   Reasons: This function is 0 along the lines $x = \pm 1$ and $y = \pm 1$. The only contour map in which this could occur is VI. Also note that the trace in the $xz$-plane is the parabola $z = 1 - x^2$ and the trace in the $yz$-plane is the parabola $z = 1 - y^2$, so the graph is B.

46. $z = \frac{x - y}{1 + x^2 + y^2}$  
   (a) D  
   (b) V  
   Reasons: This function is not periodic, ruling out the graphs in A, C, E, and F. Also, the values of $z$ approach 0 as we use points farther from the origin. The only graph that shows this behavior is D, which corresponds to V.