**5.** $x = \cos 4t$, $y = t$, $z = \sin 4t$. At any point $(x, y, z)$ on the curve, $x^2 + z^2 = \cos^2 4t + \sin^2 4t = 1$. So the curve lies on a circular cylinder with axis the $y$-axis. Since $y = t$, this is a helix. So the graph is VI.

**6.** $x = t$, $y = t^2$, $z = e^{-t}$. At any point on the curve, $y = x^2$. So the curve lies on the parabolic cylinder $y = x^2$ Note that $y$ and $z$ are positive for all $t$, and the point $(0, 0, 1)$ is on the curve (when $t = 0$). As $t \to \infty$, $(x, y, z) \to (\infty, \infty, 0)$, while as $t \to -\infty$, $(x, y, z) \to (-\infty, \infty, \infty)$, so the graph must be II.

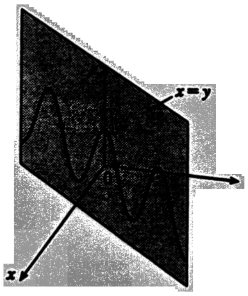
**7.** $x = t$, $y = 1/(1 + t^2)$, $z = t^2$. Note that $y$ and $z$ are positive for all $t$. The curve passes through $(0, 1, 0)$ when $t = 0$. As $t \to \infty$, $(x, y, z) \to (\infty, 0, \infty)$, and as $t \to -\infty$, $(x, y, z) \to (-\infty, 0, \infty)$. So the graph is IV.

**8.** $x = e^{-t}\cos 10t$, $y = e^{-t}\sin 10t$, $z = e^{-t}$.
$x^2 + y^2 = e^{-2t}\cos^2 10t + e^{-2t}\sin^2 10t = e^{-2t}\left(\cos^2 10t + \sin^2 10t\right) = e^{-2t} = z^2$, so the curve lies on the cone $x^2 + y^2 = z^2$. Also, $z$ is always positive; the graph must be I. [redacted]

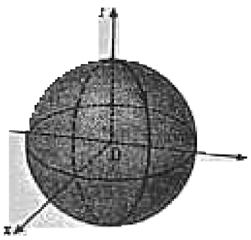
**9.** $x = \cos t$, $y = \sin t$, $z = \sin 5t$. $x^2 + y^2 = \cos^2 t + \sin^2 t = 1$, so the curve lies on a circular cylinder with axis the $z$-axis. Each of $x$, $y$ and $z$ is periodic, and at $t = 0$ and $t = 2\pi$ the curve passes through the same point, so the curve repeats itself and the graph is V. [redacted]

**10.** $x = \cos t$, $y = \sin t$, $z = \ln t$. $x^2 + y^2 = \cos^2 t + \sin^2 t = 1$, so the curve lies on a circular cylinder with axis the $z$-axis. As $t \to 0$, $z \to -\infty$, so the graph is III.

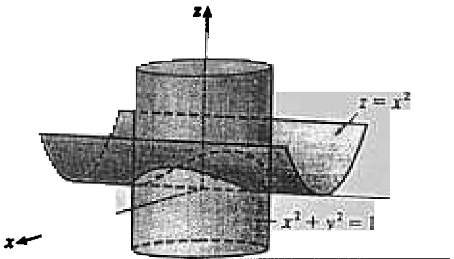
**16.** The parametric equations are $x = t$, $y = t$, $z = \cos t$. Thus $x = y$, so the curve must lie in the plane $x = y$. Combine this with $z = \cos t$ to determine that the curve traces out the cosine curve in the vertical plane $x = y$.




**18.** The parametric equations give $x^2 + y^2 + z^2 = 2\sin^2 t + 2\cos^2 t = 2$, so the curve lies on the sphere with radius $\sqrt{2}$ and center $(0, 0, 0)$. Furthermore $x = y = \sin t$, so the curve is the intersection of this sphere with the plane $x = y$, that is, the curve is the circle of radius $\sqrt{2}$, center $(0, 0, 0)$ in the plane $x = y$.




**20.** Here $x^2 = \sin^2 t = z$ and $x^2 + y^2 = \sin^2 t + \cos^2 t = 1$, so the curve is the intersection of the parabolic cylinder $z = x^2$ with the circular cylinder $x^2 + y^2 = 1$.




**28.** The projection of the curve $C$ of intersection onto the $xy$-plane is the circle $x^2 + y^2 = 4$, $z = 0$. Then we can write $x = 2\cos t$, $y = 2\sin t$, $0 \le t \le 2\pi$. Since $C$ also lies on the surface $z = xy$, we have $z = xy = (2\cos t)(2\sin t) = 4\cos t \sin t$, or $2\sin(2t)$. Then parametric equations for $C$ are $x = 2\cos t$, $y = 2\sin t$, $z = 2\sin(2t)$, $0 \le t \le 2\pi$, and the corresponding vector function is $\mathbf{r}(t) = 2\cos t\,\mathbf{i} + 2\sin t\,\mathbf{j} + 2\sin(2t)\mathbf{k}$, $0 \le t \le 2\pi$.

[redacted]