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 \( t \to -\infty \), \((x, y, z) \to (-\infty, \infty, 0)\), 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 \( t \to \infty \), \((x, y, z) \to (\infty, 0, 0)\), and as \( t \to -\infty \), \((x, y, z) \to (-\infty, 0, 0)\). So the graph is IV.

8. \( x = e^{-t} \cos 10t, y = e^{-t} \sin 10t, z = e^{-t} \).

\[ x^2 + y^2 = e^{-2t} \cos^2 10t + e^{-2t} \sin^2 10t = e^{-2t} (\cos^2 10t + \sin^2 10t) = e^{-2t} = z^2, \]

so the curve lies on the cone \( z^2 = x^2 + y^2 \). Also, \( z \) is always positive; the graph must be I.

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.

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 \( t \to 0, x \to -\infty \), 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 \( x = \cos t \) 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 \( x^2 + y^2 = 1 \).

29. 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 \( z = 2 \cos t, y = 2 \sin t, 0 \leq t \leq 2\pi \). 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

\[ z = 2 \cos t, y = 2 \sin t, x = 2 \sin(2t), 0 \leq t \leq 2\pi, \] and the corresponding vector function is

\[ r(t) = 2 \cos t \hat{i} + 2 \sin t \hat{j} + 2 \sin(2t) \hat{k}, 0 \leq t \leq 2\pi. \]