8. (a) The distance from a point to the $xy$-plane is the absolute value of the $z$-coordinate of the point. Thus, the distance is $|6| = 6$.

(b) Similarly, the distance to the $yz$-plane is the absolute value of the $x$-coordinate of the point: $|4| = 4$.

(c) The distance to the $xz$-plane is the absolute value of the $y$-coordinate of the point: $|-2| = 2$.

(d) The point on the $x$-axis closest to $(4, -2, 6)$ is the point $(4, 0, 0)$. (Approach the $x$-axis perpendicularly.)

The distance from $(4, -2, 6)$ to the $x$-axis is the distance between these two points:

$$\sqrt{(4-4)^2 + (-2-0)^2 + (6-0)^2} = \sqrt{40} = 2\sqrt{10} \approx 6.32.$$ 

(e) The point on the $y$-axis closest to $(4, -2, 6)$ is $(0, -2, 0)$. The distance between these points is

$$\sqrt{(4-0)^2 + (-2-(-2))^2 + (6-0)^2} = \sqrt{52} = 2\sqrt{13} \approx 7.21.$$ 

(f) The point on the $z$-axis closest to $(4, -2, 6)$ is $(0, 0, 6)$. The distance between these points is

$$\sqrt{(4-0)^2 + (-2-0)^2 + (6-6)^2} = \sqrt{20} = 2\sqrt{5} \approx 4.47.$$ 

12. If the sphere passes through the origin, the radius of the sphere must be the distance from the origin to the point $(1, 2, 3)$:

$$r = \sqrt{(1-0)^2 + (2-0)^2 + (3-0)^2} = \sqrt{14}.$$ 

Then an equation of the sphere is $(x - 1)^2 + (y - 2)^2 + (z - 3)^2 = 14$.

14. Completing squares in the equation gives $(x^2 + 8x + 16) + (y^2 - 6y + 9) + (z^2 + 2z + 1) = -17 + 16 + 9 + 1$ 

$\Rightarrow (x + 4)^2 + (y - 3)^2 + (z + 1)^2 = 9$, which we recognize as an equation of a sphere with center $(-4, 3, -1)$ and radius 3.

22. The equation $y = -2$ represents a plane parallel to the $xz$-plane and 2 units to the left of it.

24. The inequality $x \geq -3$ represents a half-space consisting of all points on or in front of the plane $x = -3$.

28. The equation $z = z$ represents a plane perpendicular to the $xz$-plane and intersecting the $xz$-plane in the line $z = z, y = 0$.

30. The inequality $x^2 + y^2 + z^2 > 2z$ \iff $x^2 + y^2 + (z-1)^2 > 1$ is equivalent to $\sqrt{x^2 + y^2 + (z-1)^2} > 1$, so the region consists of those points whose distance from the point $(0, 0, 1)$ is greater than 1. This is the set of all points outside the sphere with radius 1 and center $(0, 0, 1)$.