#13.2 47:
We may apply the product rule for cross products to see that
$$\frac{d}{dt}(\mathbf{r}(t) \times \mathbf{r}'(t)) = \mathbf{r}'(t) \times \mathbf{r}'(t) + \mathbf{r}(t) \times \mathbf{r}''(t).$$

But \( \mathbf{r}'(t) \) is certainly parallel to itself, so \( \mathbf{r}'(t) \times \mathbf{r}'(t) = 0 \), and thus
$$\frac{d}{dt}(\mathbf{r}(t) \times \mathbf{r}'(t)) = \mathbf{r}(t) \times \mathbf{r}''(t).$$

#12.6 46:
Let \( P = (x, y, z) \) be a point on our surface. The distance from \( P \) to the \( yz \)-plane is exactly \( |x| \). The distance from \( P \) to the \( x \)-axis is \( \sqrt{y^2 + z^2} \). Combining these facts we see that \( y^2 + z^2 = 4x^2 \), which is the equation for a cone.

Alternatively, we can use the method of traces in reverse: suppose that we intersect the surface with the plane \( x = k \). For any point on this plane, the distance to the \( yz \)-plane is \( |k| \). Thus any point is on the intersection of the plane and the surface exactly if it has distance \( 2|k| \) from the origin on the plane \( x = k \), which is exactly the circle
$$\begin{align*}
y^2 + z^2 &= 4k^2 \\
x &= k
\end{align*}$$

Substituting \( x = k \) into this we see that \( y^2 + z^2 = 4x^2 \).