24. In this projectile motion problem, we have $v_0 = v_x =$ constant, and what is plotted is $v = \sqrt{v_x^2 + v_y^2}$. We infer from the plot that at $t = 2.5$ s, the ball reaches its maximum height, where $v_y = 0$. Therefore, we infer from the graph that $v_x = 19$ m/s.

(a) During $t = 5$ s, the horizontal motion is $x - x_0 = v_x t = 95$ m.

(b) Since $\sqrt{19^2 + v_{0y}^2} = 31$ m/s (the first point on the graph), we find $v_{0y} = 24.5$ m/s. Thus, with $t = 2.5$ s, we can use $y_{\max} - y_0 = v_{0y} t - \frac{1}{2} g t^2$ or $v_y^2 = 0 = v_{0y}^2 - 2g(y_{\max} - y_0)$, or $y_{\max} - y_0 = \frac{1}{2}\left(v_y + v_{0y}\right) t$ to solve. Here we will use the latter:

$$y_{\max} - y_0 = \frac{1}{2}\left(v_y + v_{0y}\right) t \implies y_{\max} = \frac{1}{2}(0 + 24.5)(2.5) = 31 \text{ m}$$

where we have taken $y_0 = 0$ as the ground level.