79. We let g_p denote the magnitude of the gravitational acceleration on the planet. A number of the points on the graph (including some "inferred" points – such as the max height point at $x = 12.5$ m and $t = 1.25$ s) can be analyzed profitably; for future reference, we label (with subscripts) the first ($(x_0, y_0) = (0, 2)$ at $t_0 = 0$) and last ("final") points ($(x_f, y_f) = (25, 2)$ at $t_f = 2.5$), with lengths in meters and time in seconds.

(a) The x-component of the initial velocity is found from $x_f - x_0 = v_{0x}t_f$. Therefore, $v_{0x} = 25/2.5 = 10$ m/s. And we try to obtain the y-component from $y_f - y_0 = 0 = v_{0y}t_f - \frac{1}{2}g_p t_f^2$. This gives us $v_{0y} = 1.25g_p$, and we see we need another equation (by analyzing another point, say, the next-to-last one) $y - y_0 = v_{0y}t - \frac{1}{2}g_p t^2$ with $y = 6$ and $t = 2$; this produces our second equation $v_{0y} = 2 + g_p$. Simultaneous solution of these two equations produces results for v_{0y} and g_p (relevant to part (b)). Thus, our complete answer for the initial velocity is $\vec{v} = 10\hat{\imath} + 10\hat{\jmath}$ m/s.

(b) As a by-product of the part (a) computations, we have $g_p = 8.0\,\text{m/s}^2$.

(c) Solving for t_g (the time to reach the ground) in $y_g = 0 = y_0 + v_{0y}t_g - \frac{1}{2}g_p t_g^2$ leads to a positive answer: $t_g = 2.7$ s.

(d) With $g = 9.8$ m/s^2, the method employed in part (c) would produce the quadratic equation $-4.9t_g^2 + 10t_g + 2 = 0$ and then the positive result $t_g = 2.2$ s.