13. Constant acceleration in both directions (x and y) allows us to use Table 2-1 for the motion along each direction. This can be handled individually (for Δx and Δy) or together with the unit-vector notation (for Δr). Where units are not shown, SI units are to be understood.

   (a) The velocity of the particle at any time t is given by $\vec{v} = \vec{v}_0 + \vec{a}t$, where $\vec{v}_0$ is the initial velocity and $\vec{a}$ is the (constant) acceleration. The x component is $v_x = v_{0x} + a_x t = 3.00 - 1.00t$, and the y component is $v_y = v_{0y} + a_y t = -0.500t$ since $v_{0y} = 0$. When the particle reaches its maximum x coordinate at $t = t_m$, we must have $v_x = 0$. Therefore, $3.00 - 1.00t_m = 0$ or $t_m = 3.00$ s. The y component of the velocity at this time is $v_y = 0 - 0.500(3.00) = -1.50$ m/s; this is the only nonzero component of $\vec{v}$ at t_m.

   (b) Since it started at the origin, the coordinates of the particle at any time t are given by $\vec{r} = \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$. At $t = t_m$ this becomes

$$(3.00\,\hat{\mathrm{i}})(3.00) + \frac{1}{2}(-1.00\,\hat{\mathrm{i}} - 0.50\,\hat{\mathrm{j}})(3.00)^2 = 4.50\,\hat{\mathrm{i}} - 2.25\,\hat{\mathrm{j}}$$

   in meters.