2. $\frac{x^2}{9} + \frac{y^2}{4} = 1$

$\frac{1}{9}x^2 + \frac{1}{4}y^2 = 1$

$\left(\frac{1}{3}x\right)^2 + \left(\frac{1}{2}y\right)^2 = 1$

RECALL: $(\cos t)^2 + (\sin t)^2 = 1$

so

$\frac{1}{3}x = \cos t \qquad \frac{1}{2}y = \sin t$

$x = 3\cos t \qquad y = 2\sin t$

$\vec{r}(t) = 3\cos t\,\vec{i} + 2\sin t\,\vec{j} \quad 0 \le t \le 2\pi$

3.

$(0,0) \to (4,2)$

① $0 \le t \le 1$

$x(t) = 4t \qquad y(t) = 2t$

$(4,2) \to (0,0)$

② $1 \le t \le 2$

$x(t) = 8 - 4t \qquad y(t) = \sqrt{\text{"}x\text{"}} = \sqrt{8-4t}$

$at+b = 4 \qquad at+b = 0$

$t = 1 \qquad t = 2$

$a+b = 4 \qquad 2a+b = 0$

$2a+b = 0$

$-a-b = -4$

$a = -4$

$a+b = 4$

$-4+b = 4$

$b = 8$

Form: $at+b = -4t+8$

$$\vec{r}(t) = \begin{cases} 4t\,\vec{i} + 2t\,\vec{j} & 0 \le t \le 1 \\ (8-4t)\,\vec{i} + \sqrt{8-4t}\,\vec{j} & 1 \le t \le 2 \end{cases}$$