Let us first consider the case $t > 0$. We compute

$$\mathbf{R}'(t) = 6t\mathbf{i} + 6t^2\mathbf{j} \text{ and } \|\mathbf{R}'(t)\| = \sqrt{(6t)^2 + (6t^2)^2} = \sqrt{(6t)^2(1+t^2)} = 6t\sqrt{1+t^2}.$$

Then

$$\mathbf{T}(t) = \frac{\mathbf{R}'(t)}{\|\mathbf{R}'(t)\|} = (1+t^2)^{-1/2}\mathbf{i} + t(1+t^2)^{-1/2}\mathbf{j}).$$

Obtaining this formula, or an equivalent form of it gives you half of the points.

Next, using the chain rule and the product rule, we compute

$$\begin{aligned}\mathbf{T}'(t) &= -\frac{1}{2}(1+t^2)^{-3/2}2t\mathbf{i} + [(1+t^2)^{-1/2} - t\frac{1}{2}(1+t^2)^{-3/2}2t\mathbf{j} \\ &= -t(1+t^2)^{-3/2}\mathbf{i} + [(1+t^2)(1+t^2)^{-3/2} - t^2(1+t^2)^{-3/2}]\mathbf{j} = (1+t^2)^{-3/2}(-t\mathbf{i} + \mathbf{j}).\end{aligned}$$

Then

$$\|\mathbf{T}'(t)\| = (1+t^2)^{-3/2}\sqrt{(-t)^2 + 1}.$$

Consequently

$$\mathbf{N}(t) = \frac{\mathbf{T}'(t)}{\|\mathbf{T}'(t)\|} = -t(1+t^2)^{-1/2}\mathbf{i} + (1+t^2)^{-1/2}\mathbf{j}.$$

If $t < 0$, then $\sqrt{t^2} = -t$, so $\|\mathbf{R}'(t)\| = -6t(1+t^2)$. The computations are the same, but all results will have a negative in front. I did not take out one point from people who only did the case $t > 0$.