6. $\vec{r}(t) = t^2\vec{i} + 5t\vec{j}$, $t = 1$

$\vec{r}\,'(t) = 2t\vec{i} + 5\vec{j}$

$t = 1$

$\vec{r}\,'(1) = 2\vec{i} + 5\vec{j}$

$\|\vec{r}\,'(t)\| = \sqrt{(2t)^2 + 5^2} = \sqrt{4t^2 + 25}$

$\|\vec{r}\,'(1)\| = \sqrt{4(1)^2 + 25} = \sqrt{29}$

$\vec{T}(t) = \dfrac{\vec{r}\,'(t)}{\|\vec{r}\,'(t)\|} = \dfrac{2\vec{i} + 5\vec{j}}{\sqrt{4t^2+25}}$

$= \dfrac{2t}{\sqrt{4t^2+25}}\vec{i} + \dfrac{5}{\sqrt{4t^2+25}}\vec{j}$

$= \underbrace{2t}_{d}\underbrace{(4t^2+25)^{-\frac{1}{2}}}_{Q}\vec{i} + 5(4t^2+25)^{-\frac{1}{2}}\vec{j}$

$d = 2t \quad Q = (4t^2+25)^{-\frac{1}{2}}$

$Q' = -\frac{1}{2}(4t^2+25)^{-\frac{3}{2}} \cdot 8t$

$= \dfrac{-4t}{(4t^2+25)^{3/2}}$

$d'Q + Q'd$

$\vec{T}\,'(t) = \left[2(4t^2+25)^{-\frac{1}{2}} + 2t\left(\dfrac{-4t}{(4t^2+25)^{3/2}}\right)\right]\vec{i} + 5\left(\dfrac{-4t}{(4t^2+25)^{3/2}}\right)\vec{j}$

$\vec{T}\,'(t) = \left[\dfrac{2}{(4t^2+25)^{1/2}} - \dfrac{8t^2}{(4t^2+25)^{3/2}}\right]\vec{i} + \dfrac{-20t}{(4t^2+25)^{3/2}}\vec{j}$

$\vec{T}\,'(t) = \left[\dfrac{1}{(4t^2+25)^{1/2}} \cdot \dfrac{2}{1} - \dfrac{8t^2}{(4t^2+25)^{3/2}}\right]\vec{i} + \dfrac{-40t}{(4t^2+25)^{3/2}}\vec{j}$

$\vec{T}\,'(t) = \left[\dfrac{50+8t^2}{(4t^2+25)^{3/2}} - \dfrac{8t^2}{(4t^2+25)^{3/2}}\right]\vec{i} + \dfrac{-40t}{(4t^2+25)^{3/2}}\vec{j}$

$\vec{T}\,'(1) = \dfrac{50}{(4t^2+25)^{3/2}}\vec{i} + \dfrac{-40t}{(4t^2+25)^{3/2}}\vec{j}$