DERIVATIVES OF VECTOR-VALUED FUNCTONS - ANSWERS

For each vector-valued function $\vec{r}(t)$ below, find $\dfrac{d\vec{r}}{dt}$.

1. $\vec{r}(t) = t\hat{i} + t^2\hat{j} + \dfrac{1}{t}\hat{k}$

   $\vec{r}'(t) = \hat{i} + 2t\hat{j} - \dfrac{1}{t^2}\hat{k}$

2. $\vec{r}(t) = \sqrt{t}\,\hat{i} + e^{3t}\hat{j} + \ln(t)\hat{k}$

   $\vec{r}'(t) = \dfrac{1}{2\sqrt{t}}\hat{i} + 3e^{3t}\hat{j} + \dfrac{1}{t}\hat{k}$

3. $\vec{r}(t) = \cos(t)\hat{i} + \sin(t)\hat{j} + \tan(t)\hat{k}$

   $\vec{r}'(t) = -\sin(t)\hat{i} + \cos(t)\hat{j} + \sec^2(t)\hat{k}$

4. $\vec{r}(t) = \dfrac{t}{1+t^2}\hat{i} + \sec(t)\hat{j} + \dfrac{e^t - e^{-t}}{2}\hat{k}$

   $\vec{r}'(t) = \dfrac{1-t^2}{(1+t^2)^2}\hat{i} + \sec(t)\tan(t)\hat{j} + \dfrac{e^t + e^{-t}}{2}\hat{k}$

5. $\vec{r}(t) = \cos^2(t)\hat{i} + \sin^2(t)\hat{j} + \sec^2(t)\hat{k}$

   $\vec{r}'(t) = -2\sin(t)\cos(t)\hat{i} + 2\sin(t)\cos(t)\hat{j} + 2\sec^2(t)\tan(t)\hat{k}$