5. $R = (\cos t + \sin t)\,i + (\sin t - \cos t)\,j + \frac{1}{2}t\,k$

(a) $V = \frac{dR}{dt} = (-\sin t + \cos t)\,i + (\cos t + \sin t)\,j + \frac{1}{2}k$

$|V| = \sqrt{1+1+\frac{1}{4}} = \frac{3}{2}$

(b) $\vec{a} = \frac{d^2R}{dt^2} = (-\cos t + (-\sin t))\,i + (-\sin t + \cos t)\,j + 0\cdot k$

$= -\cos t\,(i-j) - \sin t\,(i+j)$

(c) $T = \frac{V}{|V|} = \frac{2}{3}\left[(-\sin t + \cos t)\,i + (\cos t + \sin t)\,j + \frac{1}{2}k\right]$

(d) $k = \dfrac{\left|\frac{dT}{dt}\right|}{\frac{ds}{dt}} = \dfrac{\frac{2}{3}\cdot\sqrt{2}}{\frac{3}{2}} = \frac{4}{9}\sqrt{2}$

since $\frac{dT}{dt} = \frac{2}{3}\left[(-\cos t - \sin t)\,i + (-\sin t + \cos t)\,j + 0\cdot k\right]$

(e) If we change the axis.

Let $i' = i - j$, $j' = i + j$

then $R = \cos t\,i' + \sin t\,j' + \frac{1}{2}t\,k$.

$\therefore$ the curve is a helix.