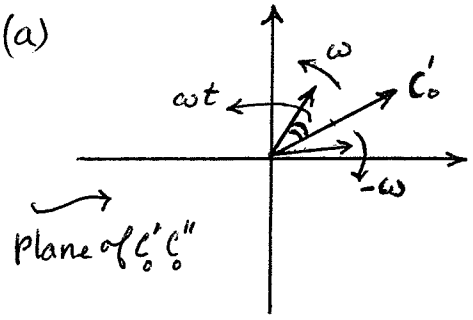
Problem 30)

$$C(t) = \mathrm{Re}\{(C_o' + iC_o'')(\cos\omega t - i\sin\omega t)\} = C_o'\cos\omega t + C_o''\sin\omega t$$

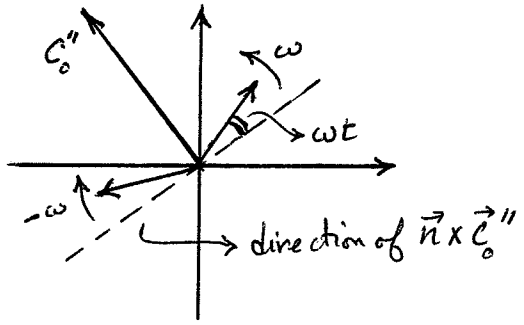
(a)



Sum of the two short vectors

$= \frac{1}{2}\vec{C}_o'\cos\omega t + \frac{1}{2}\vec{C}_o'\cos\omega t = \vec{C}_o'\cos\omega t$

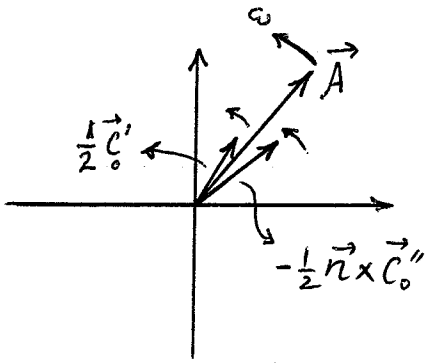
(b)



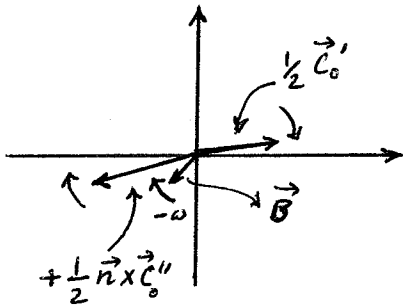
Sum of the two short vectors

$= \frac{1}{2}\vec{C}_o''\sin\omega t + \frac{1}{2}\vec{C}_o''\sin\omega t = \vec{C}_o''\sin\omega t$

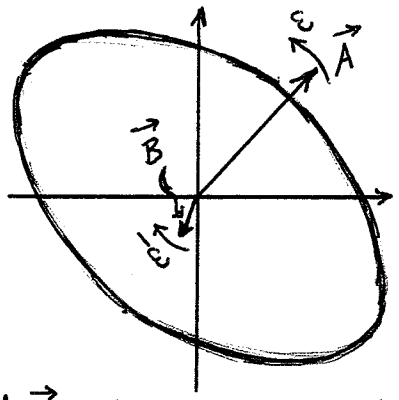
c)



Both vectors $\frac{1}{2}\vec{C}_o'$ and $-\frac{1}{2}\vec{n}\times\vec{C}_o''$ rotate counterclockwise. Their sum $\vec{A}$ also rotates counterclockwise with angular velocity ω.



Both vectors $\frac{1}{2}\vec{C}_o'$ and $+\frac{1}{2}\vec{n}\times\vec{C}_o''$ rotate clockwise. Their sum $\vec{B}$ also rotates clockwise with angular velocity $-\omega$.



The sum of $\vec{A}$ and $\vec{B}$ traverses an ellipse as a function of time. The major semi-axis of this ellipse has length $|\vec{A}|+|\vec{B}|$, while the minor semi-axis has length $|\vec{A}|-|\vec{B}|$. The vectors $\vec{A}$ and $\vec{B}$ are made up of the same vectors that make up $\vec{C}_o'$ and $\vec{C}_o''$; therefore $\vec{C}(t)$ traverses the same ellipse.