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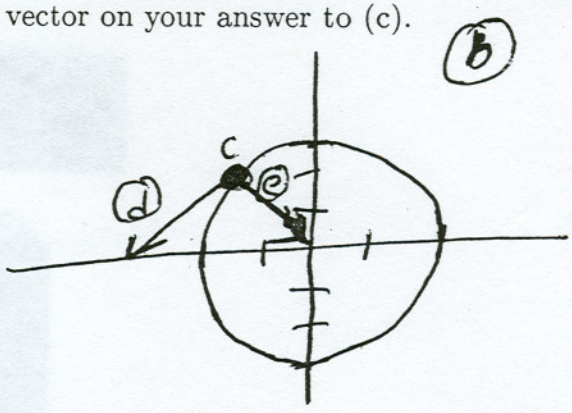
18. (14 points) Consider the curve $\vec{r}(t) = -2\sin t\,\vec{i} + 3\cos t\,\vec{j}$.
   (a) Eliminate the parameter and find an equation for this curve which involves only x and y.
   (b) Sketch the curve.
   (c) Which point on the curve corresponds to $t = \frac{\pi}{4}$.
   (d) Graph $\vec{r}\,'(\frac{\pi}{4})$. Put the tail of your vector on your answer to (c).
   (e) Graph $\vec{r}\,''(\frac{\pi}{4})$. Put the tail of your vector on your answer to (c).

$\begin{cases} x = -2\sin t \\ y = 3\cos t \end{cases}$

$\frac{x^2}{4} + \frac{y^2}{9} = 1$ (a)

$\begin{cases} \frac{x}{-2} = \sin t \\ \frac{y}{3} = \cos t \end{cases}$



$\vec{r}(\frac{\pi}{4}) = -2\frac{\sqrt{2}}{2}\vec{i} + 3\frac{\sqrt{2}}{2}\vec{j}$

(c) at $\frac{\pi}{4}$ the object is on $\left(-\sqrt{2}, \frac{3\sqrt{2}}{2}\right)$

(d) $\vec{r}\,'(t) = -2\cos t\,\vec{i} - 3\sin t\,\vec{j}$

$\vec{r}\,'(\frac{\pi}{4}) = -2\frac{\sqrt{2}}{2}\vec{i} - 3\frac{\sqrt{2}}{2}\vec{j}$

$\vec{r}\,'(\frac{\pi}{4}) = -\sqrt{2}\vec{i} - 3\frac{\sqrt{2}}{2}\vec{j}$

(e) $\vec{r}\,''(t) = 2\sin t\,\vec{i} - 3\cos t\,\vec{j}$

$\vec{r}\,''(\frac{\pi}{4}) = \sqrt{2}\vec{i} - 3\frac{\sqrt{2}}{2}\vec{j}$