Homework for Section 13.5, MA113(Rickert)

Exercise 13.5 #9

Exercise 13.5 #12

Exercise 13.5 #20

For **4-8** Find $\vec{\mathbf{T}}(t)$, $\vec{\mathbf{N}}(t)$, a_T and a_N at the given times t for the curve $\vec{\mathbf{r}}(t)$.

4 $\vec{\mathbf{r}}(t) = e^{-t}\cos(t)\hat{\mathbf{i}} + \mathbf{e^{-t}}\sin(\mathbf{t})\hat{\mathbf{j}}$, $t = \pi/2$.

5 $\vec{\mathbf{r}}(t) = a\cos(\omega t)\hat{\mathbf{i}} + \mathbf{b}\sin(\omega\mathbf{t})\hat{\mathbf{j}}$, $t = 0$.

6 $\vec{\mathbf{r}}(t) = (\omega t - \sin(\omega t))\hat{\mathbf{i}} + (\mathbf{1} - \cos(\omega\mathbf{t}))\hat{\mathbf{j}}$, $t = t_0$.

7 $\vec{\mathbf{r}}(t) = \langle\cos(3t), \sin(3t), 4t\rangle$, $t = \pi/3$.

8 $\vec{\mathbf{r}}(t) = \langle\cos(3t), \sin^3(t), \sin(3t)\rangle$, $t = \pi/9$.

9 For the baseball of exercise 13.2 #30,

(A) Find $\vec{\mathbf{T}}(t)$, $\vec{\mathbf{N}}(t)$, a_T and a_N.

(B) What are a_T and a_N when the ball is passing over the 340 foot fence? What do these tell us?

10 A bumblebee is flying so that its position is given by

$$\vec{\mathbf{r}}(t) = \langle\cos(2t), \cos(5t), \sin(3t)\rangle.$$

(A) Find $\vec{\mathbf{r}}(\pi/6), \vec{\mathbf{v}}(\pi/6), \vec{\mathbf{a}}(\pi/6)$.

(B) Find $\vec{\mathbf{T}}(\pi/6)$, $\vec{\mathbf{N}}(\pi/6)$, $a_T(\pi/6)$ and $a_N(\pi/6)$.

(C) For the osculating circle at $t = \pi/6$, find either the equation, or a set of parametric equations describing this osculating circle.