

### 13.3 answers

①  $10\sqrt{5}$

②  $\int_{-5}^6 \sqrt{4+e^{2t}+36t^2} dt \approx 506.407$

③ a)  $\vec{r}(s) = \frac{5s}{\sqrt{26}} \vec{i} + \cos \frac{s}{\sqrt{26}} \vec{j} + \sin \frac{s}{\sqrt{26}} \vec{k}$

b)  $r(s) = \left\langle \frac{3s}{\sqrt{14}}, 1 + \frac{2s}{\sqrt{14}}, 4 - \frac{s}{\sqrt{14}} \right\rangle$

④ a)  $\vec{N}(t) = -\cos t \vec{j} + \sin t \vec{k}$ ,  $\vec{T}(t) = \frac{1}{\sqrt{5}}(2\vec{i} - \sin t \vec{j} - \cos t \vec{k})$

b)  $\vec{T}(t) = \frac{1}{e^{2t}+1} [-\vec{i} + e^{2t} \vec{j} - \sqrt{2} e^t \vec{k}]$

$$\vec{N}(t) = \frac{1}{e^{2t}+1} (\sqrt{2} e^t \vec{i} + \sqrt{2} e^t \vec{j} + (e^{2t}-1) \vec{k})$$

⑤ a)  $k(t) = \frac{1}{5}$       b)  $\frac{\sqrt{2} e^{2t}}{(e^{2t}+1)^2}$

⑥  $k(t) = \frac{2\sqrt{13}}{(4t^2+13)^{\frac{3}{2}}}$

⑦  $k(1) = \frac{2\sqrt{13}}{17^{\frac{3}{2}}}$

⑧  $k(x) = \frac{96x^2}{[1+(32x^3-1)^2]^{\frac{3}{2}}}$

⑨ a) point B

b)  ~~$\vec{r} = 0, 1, 5 \Rightarrow \dots$~~

I'll show you in class

$$\textcircled{10} \quad \vec{T}(1) = \frac{1}{2} (\vec{i} - \sqrt{2} \vec{j} - \vec{k})$$

$$\vec{N}(1) = \frac{\sqrt{2}}{2} (\vec{i} + \vec{k})$$

$$\vec{B}(1) = -\frac{1}{2} \vec{i} - \frac{\sqrt{2}}{2} \vec{j} + \frac{1}{2} \vec{k}$$

$$\textcircled{11} \quad \text{Osculating Plane: } (x - \frac{1}{3}) + \sqrt{2}(y + \frac{\sqrt{2}}{2}) - (z + 1) = 0$$

$$\text{Normal Plane: } (x - \frac{1}{3}) - \sqrt{2}(y + \frac{\sqrt{2}}{2}) - (z + 1) = 0$$

$\textcircled{12} \quad \vec{N}(t)$  does not exist