8 Section 14.1

- Vector function:
$$\overrightarrow{r}(t) =< f(t), g(t), h(t) >$$
where f, g, h are component functions.

- Parametric equations of a space curve C:
$$\overrightarrow{r} = \overrightarrow{r}(t) =< x, y, z > \Leftrightarrow \begin{cases} x = f(t) \\ y = g(t) \\ z = h(t) \end{cases}$$

- Limit of a vector function:
$$\lim_{t \to a} \overrightarrow{r}(t) =< \lim_{t \to a} f(t), \lim_{t \to a} g(t), \lim_{t \to a} h(t) >$$

9 Section 14.2

- Derivative:
$$\overrightarrow{r}'(t) =< f'(t), g'(t), h'(t) >= \lim_{h \to 0} \frac{\overrightarrow{r}(t+h) - \overrightarrow{r}(t)}{h}$$

- $\overrightarrow{r}$'(t) is the direction vector of the tangent line to the curve $\overrightarrow{r} = \overrightarrow{r}(t)$ at the point $P(f(t), g(t), h(t))$. Unit tangent vector
$$\overrightarrow{T}(t) = \frac{\overrightarrow{r}'(t)}{|\overrightarrow{r}'(t)|}$$

- Integral $\int \overrightarrow{r}(t)dt =< \int f(t)dt, \int g(t)dt, \int h(t)dt >$

10 Section 14.3

- Length of a curve between $P(f(a), g(a), h(a))$ and $Q(f(b), g(b), h(b))$:
$$L = \int_a^b |\overrightarrow{r}'(t)|dt = \int_a^b \sqrt{f'(t)^2 + g'(t)^2 + h'(t)^2}dt$$

- Arc length function
$$S(t) = \int_a^t |\overrightarrow{r}'(u)|du, \quad \frac{ds}{dt} = |\overrightarrow{r}'(t)|$$

- Curvature:
$$\kappa = |\frac{d\overrightarrow{T}}{ds}| = \frac{|\overrightarrow{T}'(t)|}{|\overrightarrow{r}'(t)|}$$

- Unit normal vector:

$$\overrightarrow{N}(t) = \frac{\overrightarrow{T}'(t)}{|\overrightarrow{T}'(t)|}$$

- Unite binormal vector:

$$\overrightarrow{B}(t) = \overrightarrow{T}(t) \times \overrightarrow{N}(t)$$