§13.4 #s 2, 5, 10, 14, 15, 19, 26, 46*

$\bar{v}$ = velocity = $\bar{r}' = \lim_{h\to 0} \frac{1}{h}\left[\bar{r}(t+h) - \bar{r}(t)\right]$

behaves as hoped:

$$\bar{r}' = \langle f', g', h' \rangle$$

Newton's 2nd Law

$F = ma$

$\bar{F} = m\bar{a} = m\bar{r}''$

1st Inertia

2nd $F = ma$

3rd

Tangential & Normal Components of acceleration.

$\bar{N} = \frac{1}{|\bar{T}'|}\bar{T}'$ & $\bar{B} = \bar{T} \times \bar{N}$

$\bar{v} = v\bar{T}$, where $v = |\bar{v}| = |\bar{r}'|$ = speed.

$\bar{a} = \bar{v}' = v'\bar{T} + v\bar{T}' = v'\bar{T} + |\bar{T}'|v\frac{\bar{T}'}{|\bar{T}'|}$

So v' = tangential component = a_T

$|\bar{T}'|v$ = normal component = a_N

Calculations:

$$\bar{a} = a_T\bar{T} + a_n\frac{\bar{T}'}{|\bar{T}'|}$$

Now,

9 $a_T = \frac{\bar{r}\cdot\bar{r}''}{|\bar{r}'|}$ 10 $a_N = \frac{|\bar{r}'\times\bar{r}''|}{|\bar{r}'|}$

Sketches up!

~~12.5~~

13.1 #10 $\langle \sin(\pi t), t, \cos(\pi t)\rangle$