Example) $\vec{r}\,'(t) = \langle 4t, 6t^2, 3\sqrt{t} \rangle$

$\vec{r}(0) = \langle 1, 2, 3 \rangle$

What is $\vec{r}(1)$?

$\vec{r}(t) = \langle f(t), g(t), h(t) \rangle$

$\vec{r}\,'(t) = \langle f'(t), g'(t), h'(t) \rangle$

$f'(t) = 4t$, $f(0) = 1$, $f(1) = ?$

$g'(t) = 6t^2$, $g(0) = 2$, $g(1) = ?$

$h'(t) = 3\sqrt{t}$, $h(0) = 3$, $h(1) = ?$

$$\int_0^1 f'(t)\,dt = f(1) - f(0)$$

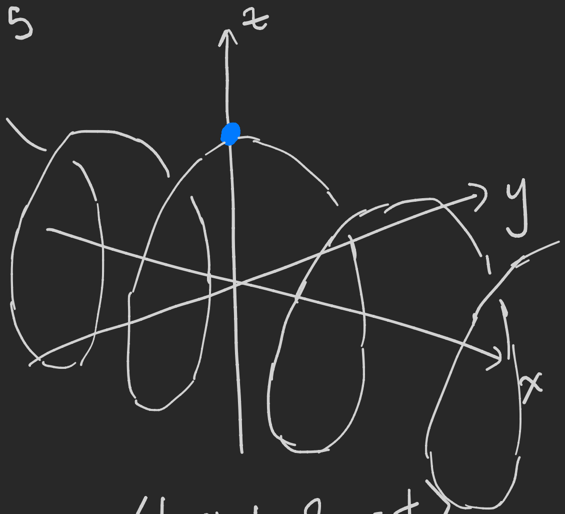
$$f(1) = 1 + \int_0^1 4t\,dt$$

$$= 1 + 2t^2\Big|_{t=0}^{1} = 3$$

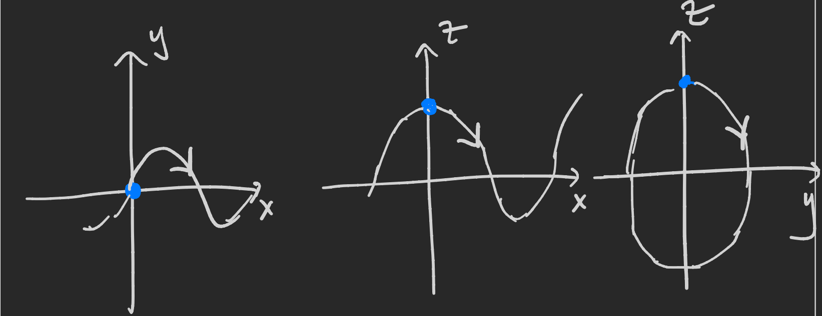
.... and do similar computations for the other parts. To summarize:

$$\int_0^1 \vec{r}\,'(t)\,dt = \vec{r}(1) - \vec{r}(0)$$

13.1 #15



$\langle t, \sin t, 2\cos t\rangle$



$$\langle a_1, a_2, a_3\rangle \times \langle b_1, b_2, b_3\rangle = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}$$

$$= \begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix} \hat{i} - \begin{vmatrix} a_1 & a_3 \\ b_1 & b_3 \end{vmatrix} \hat{j} + \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix} \hat{k}$$

12.4 #5:

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1/2 & 1/3 & 1/4 \\ 1 & 2 & -3 \end{vmatrix} = \begin{vmatrix} 1/3 & 1/4 \\ 2 & -3 \end{vmatrix} \hat{i} - \ldots$$

$$= \left( \left(\tfrac{1}{3}\right)(-3) - \left(\tfrac{1}{4}\right)(2) \right) \hat{i} - \ldots$$

$$= -\frac{3}{2} \hat{i} - \ldots - -$$