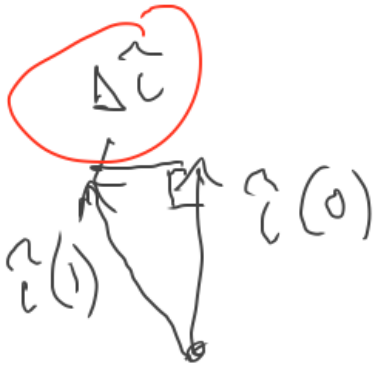
Apparent forces

- The ground isn't moving
- Still air " "
- not moving yesterday, not moving today
  $\Rightarrow$ <u>not</u> accelerating
- $\therefore$ Apollo carries the sun on his chariot
  - reverses in 12h, returns in 24h.

$\frac{d\hat{c}}{dt} = ?$ $\longleftarrow$ <u>at least</u> $\underbrace{24}_{\text{day}} \left|\hat{c}\right| = \left|\frac{d\hat{c}}{dt}\right|$

(ans: 2π)



$\hat{c}$ never changes length, so

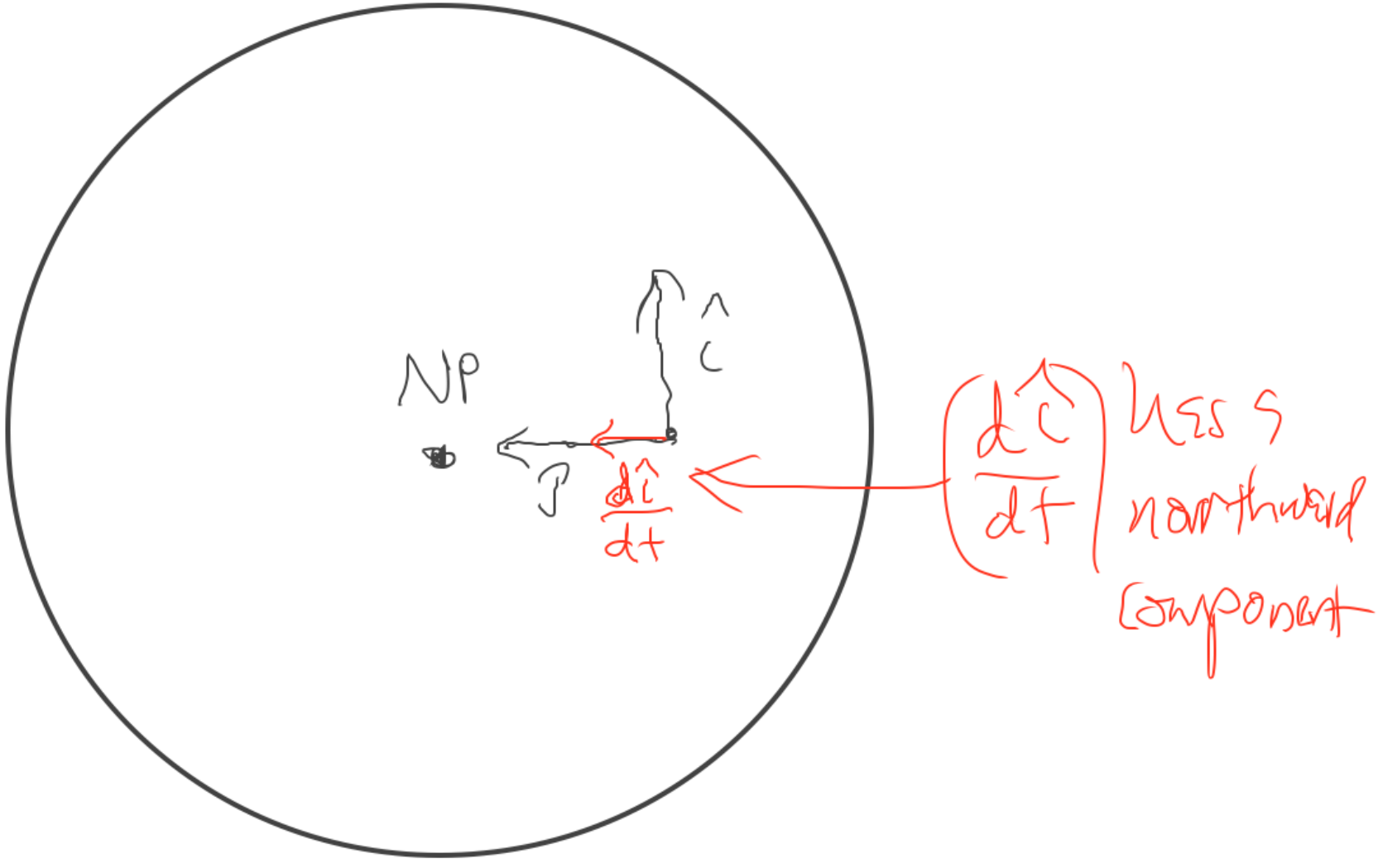
$\frac{d\hat{c}}{dt}$ is $\perp$ to $\hat{c}$

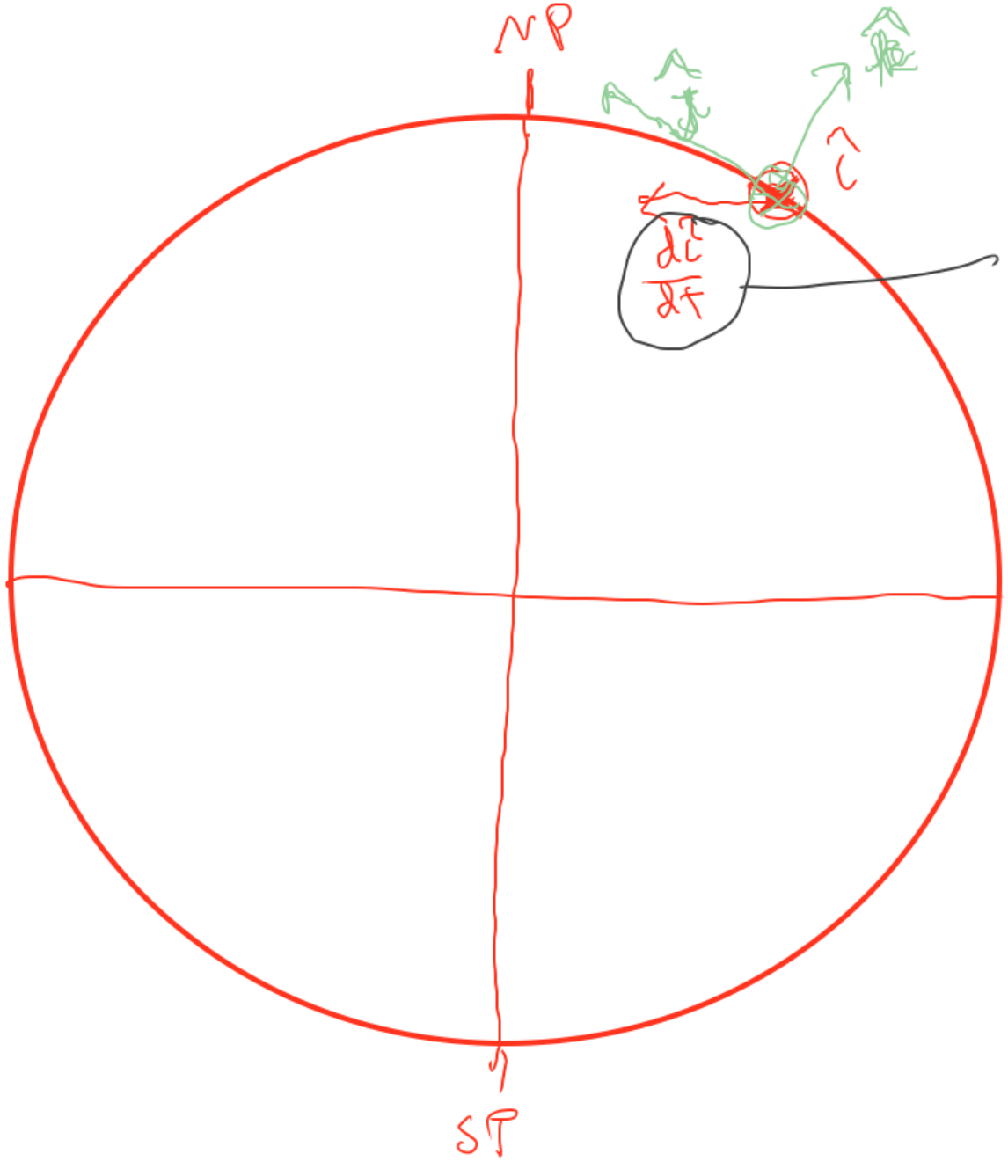
$\frac{d\hat{c}}{dt}$ is $\perp$ to $\vec{\Omega}$

points toward North star

length is $\left(\frac{2\pi \text{ radians}}{1 \text{ day}}\right)$

$$\frac{d\hat{c}}{dt} = \vec{\Omega} \times \hat{c}$$


NP
$\hat{c}$
$\hat{j}$
$\frac{d\hat{c}}{dt}$
$\left(\frac{d\hat{c}}{dt}\right)$ Has a northward component


NP
ST
$\frac{d\vec{L}}{dt}$
this has a component
• northward (positive $\hat{\theta}$)
• downward (into Earth, negative $\hat{r}$)

If $\hat{\imath}$ is changing with time, then

$$\frac{d}{dt}\left(u\hat{\imath}\right) = \frac{du}{dt}\hat{\imath} + u\frac{d\hat{\imath}}{dt}$$

$\frac{d}{dt}\left(u\hat{\imath}\right)$: a westerly wind

$\frac{du}{dt}\hat{\imath}$: real forces

$u\frac{d\hat{\imath}}{dt}$: apparent forces.

Denying the motion of the ground (and thus its acceleration) is tantamount to postulating an apparent force equal & opposite to its acceleration.

ground, coordinate