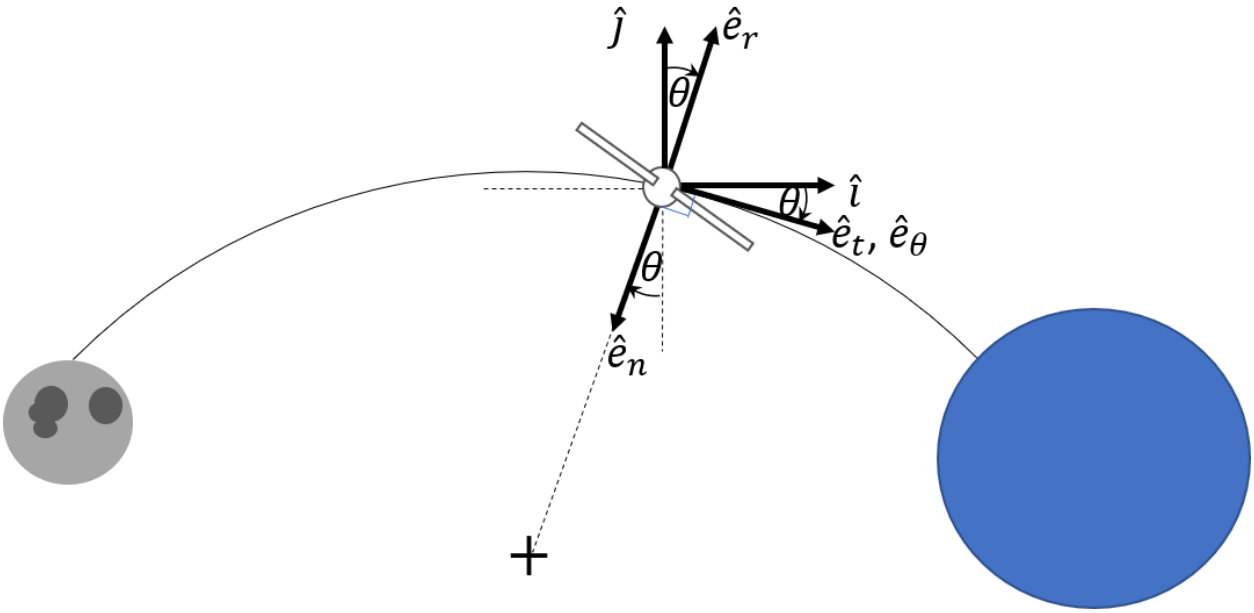
ME 274 – Spring 2023 ***Name*** _____
4:30 section – Quiz 2

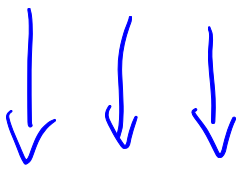
Project and represent the given coordinate systems with each of the other coordinate systems. (Hint: Notice the equivalence in path and polar descriptions, and if you find path in terms of cartesian, what will the polar in terms of cartesian look like given this equivalence between path and polar?)

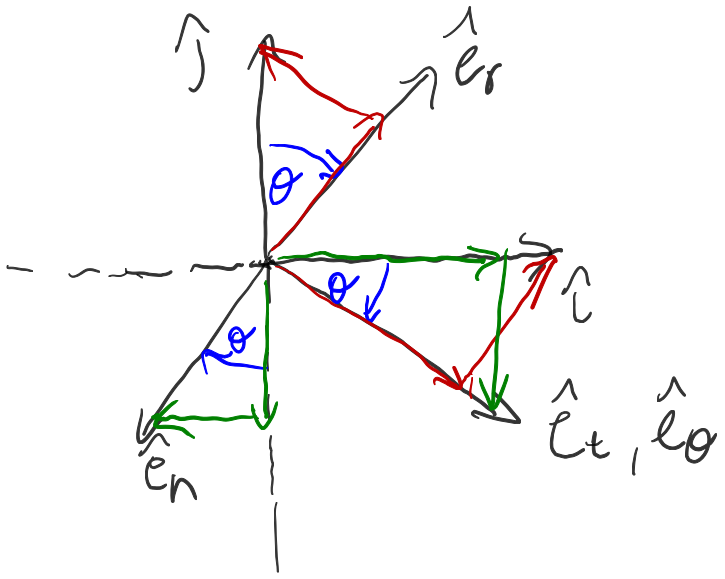


Cartesian	**Path**	**Polar**
Path:	Cartesian:	Cartesian:
$\hat{\imath} = \cos\theta\,\hat{e}_t - \sin\theta\,\hat{e}_n$	$\hat{e}_t = \cos\theta\,\hat{\imath} - \sin\theta\,\hat{\jmath}$	$\hat{e}_r = \sin\theta\,\hat{\imath} + \cos\theta\,\hat{\jmath}$
$\hat{\jmath} = -\sin\theta\,\hat{e}_t - \cos\theta\,\hat{e}_n$	$\hat{e}_n = -\sin\theta\,\hat{\imath} - \cos\theta\,\hat{\jmath}$	$\hat{e}_\theta = \cos\theta\,\hat{\imath} - \sin\theta\,\hat{\jmath}$
Polar:	Polar:	Path:
$\hat{\imath} = \sin\theta\,\hat{e}_r + \cos\theta\,\hat{e}_\theta$	$\hat{e}_t = \hat{e}_\theta$	$\hat{e}_r = -\hat{e}_n$
$\hat{\jmath} = \cos\theta\,\hat{e}_r - \sin\theta\,\hat{e}_\theta$	$\hat{e}_n = -\hat{e}_r$	$\hat{e}_\theta = \hat{e}_t$

Draw larger coordinate frames here (if needed):

see below for description:





Cartesian

$\hat{i}$: $\cos\theta\,\hat{e}_t - \sin\theta\,\hat{e}_n$

$\hat{j}$: $-\sin\theta\,\hat{e}_t - \cos\theta\,\hat{e}_n$

$\hat{i}$: $\sin\theta\,\hat{e}_r + \cos\theta\,\hat{e}_\theta$

$\hat{j}$: $\cos\theta\,\hat{e}_r - \sin\theta\,\hat{e}_\theta$

Path

$\hat{e}_t$: $\cos\theta\,\hat{i} - \sin\theta\,\hat{j}$

$\hat{e}_n$: $-\sin\theta\,\hat{i} - \cos\theta\,\hat{j}$

$\hat{e}_t$: $\hat{e}_\theta$

$\hat{e}_n$: $-\hat{e}_r$

polar

$\hat{e}_r$: $\sin\theta\,\hat{i} + \cos\theta\,\hat{j}$

$\hat{e}_\theta$: $\cos\theta\,\hat{i} - \sin\theta\,\hat{j}$

$\hat{e}_r$: $-\hat{e}_n$

$\hat{e}_\theta$: $\hat{e}_t$