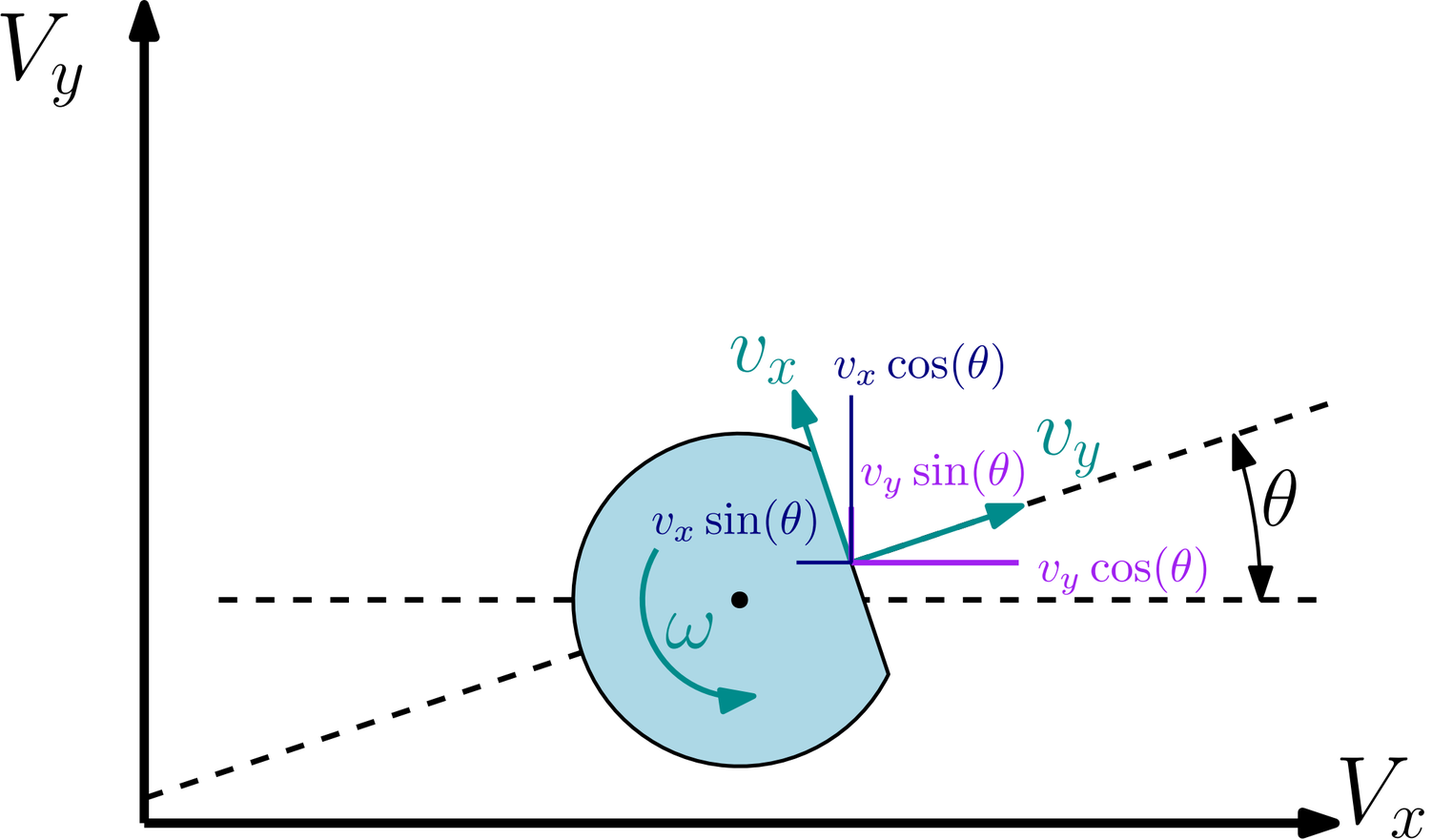
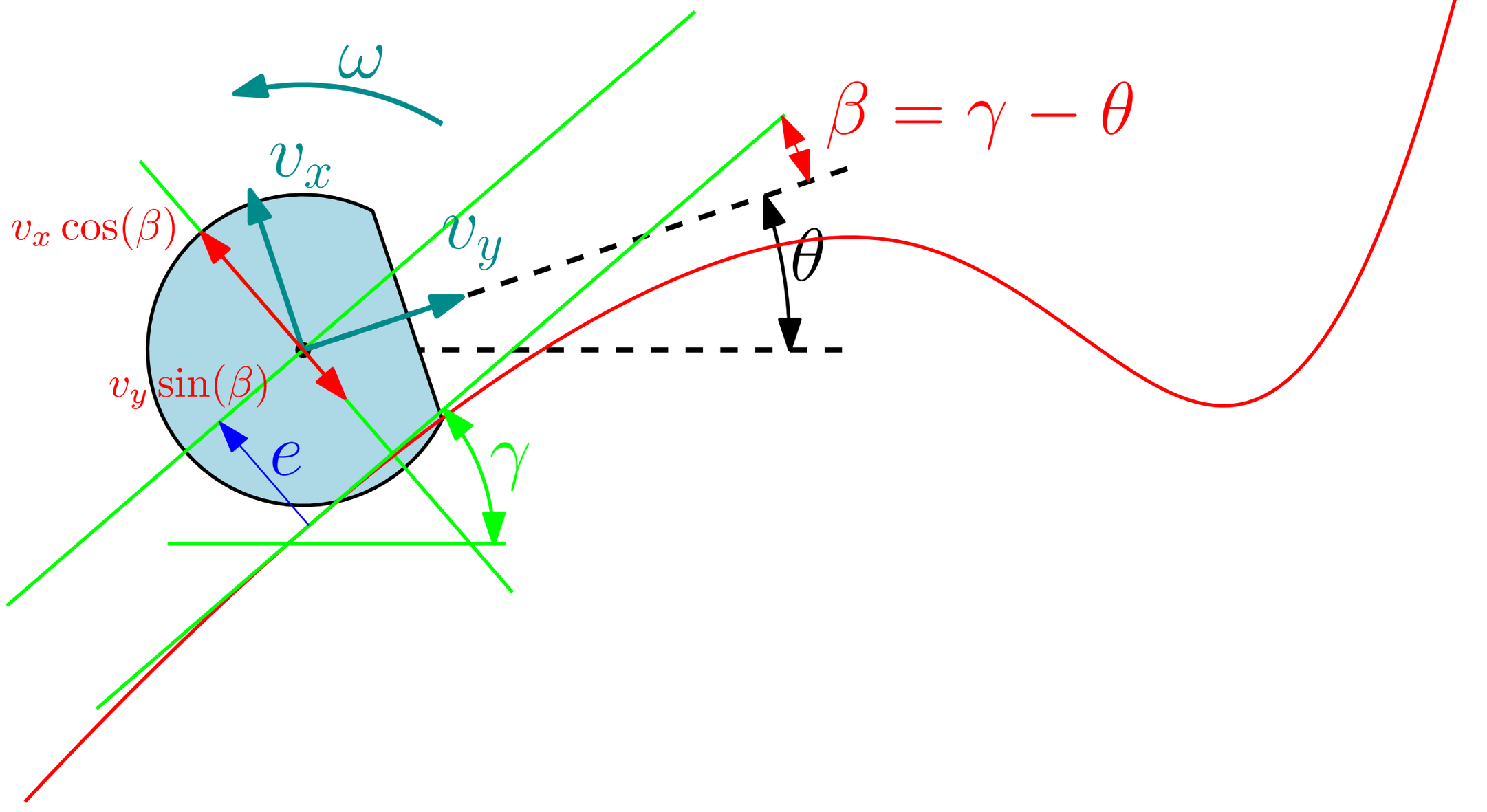



$$V_x = -v_x \sin(\theta) + v_y \cos(\theta)$$

$$V_y = v_x \cos(\theta) + v_y \sin(\theta)$$

$$\dot{\theta} = \omega$$




$$
\begin{cases}
e[k+1] = e[k] + v_x \cos(\beta) dt - a_y \sin(\beta) dt^2 \\
\beta[k+1] = \beta[k] - \omega[k] dt \\
\Delta v[k+1] = \Delta v[k] + a_y[k] dt
\end{cases}
$$

$$
\begin{cases}
A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} & x = \begin{bmatrix} e \\ \beta \\ \Delta v \end{bmatrix} \\
B = \begin{bmatrix} \cos(\beta) dt & 0 & -\sin(\beta) dt^2 \\ 0 & -dt & 0 \\ 0 & 0 & dt \end{bmatrix} & u = \begin{bmatrix} v_x \\ \omega \\ a_y \end{bmatrix}
\end{cases}
$$