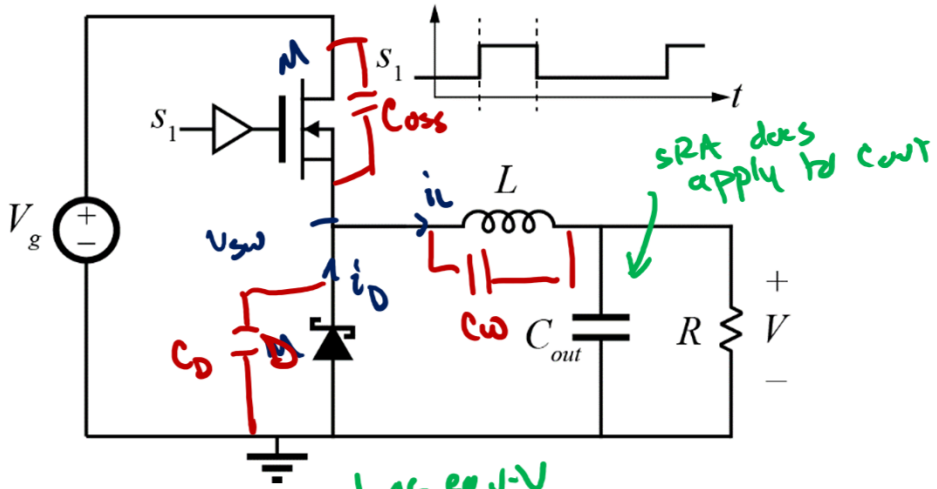
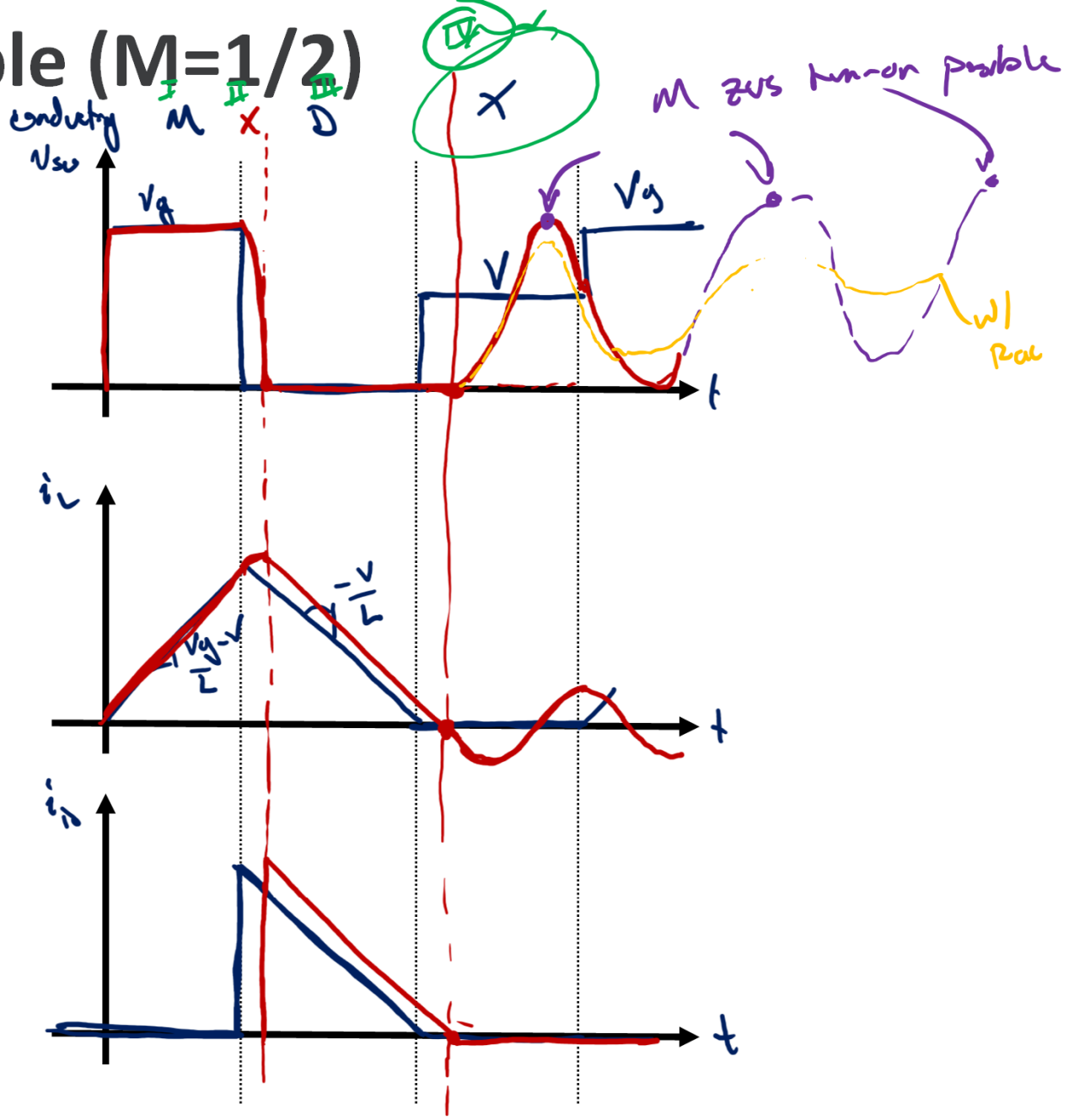
DCM Buck Converter Example (M=1/2)



@ start I.C. : $i_L(t=0) = 0$
$v_{sw}(t=0) = 0$

@ IV DC solution: $i_L \to 0$
$v_{sw} \to V$



DCM Buck State Plane ($M = \frac{1}{2}$)

$V_{base} = V_g$

$I_{base} = \frac{V_{base}}{R_0} = \frac{V_g}{R_0}$

I.C. : $(m_c, j_L) = (m_{c0}, j_{L0}) = (0,0)$

D.C. solution

$V_c \to V$

$I_L \to \phi$

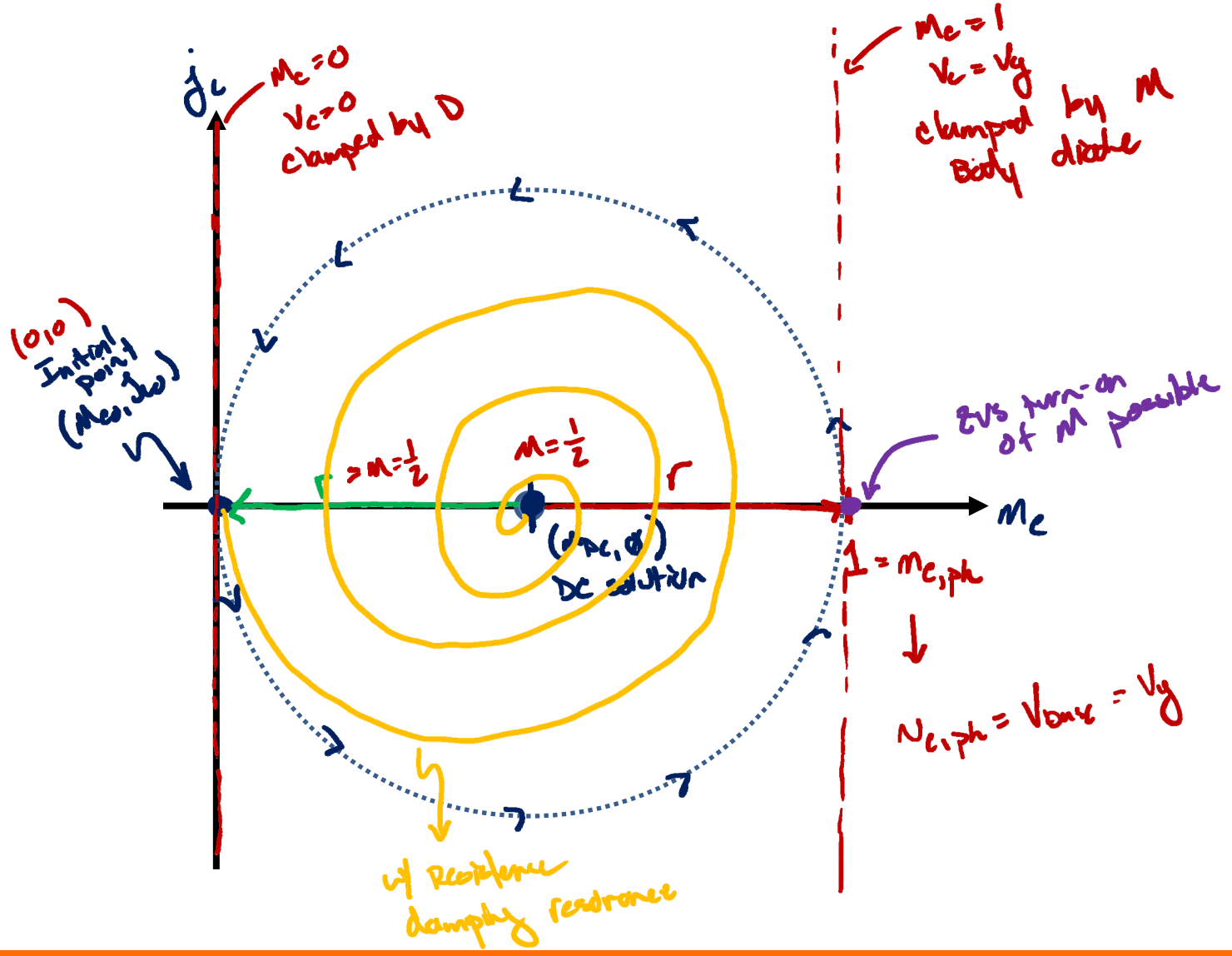
$\Big\} (M_{DC}, \phi)$ j_{DC}

$M_{DC} = \frac{V}{V_g} = M$

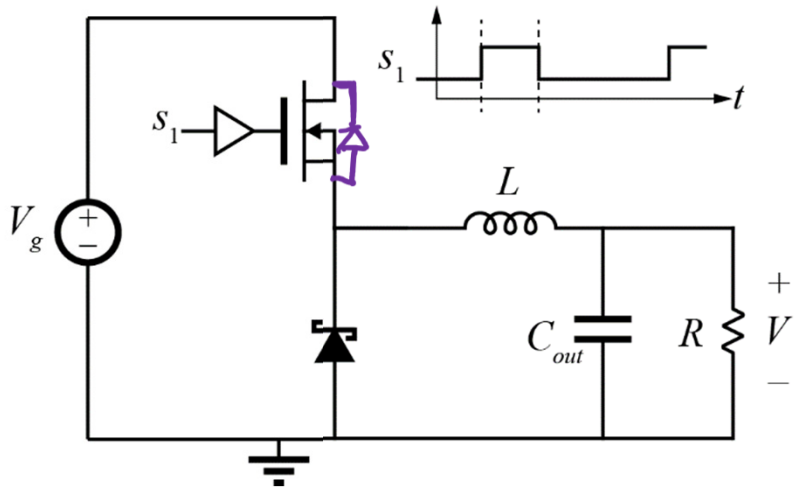
Direction:

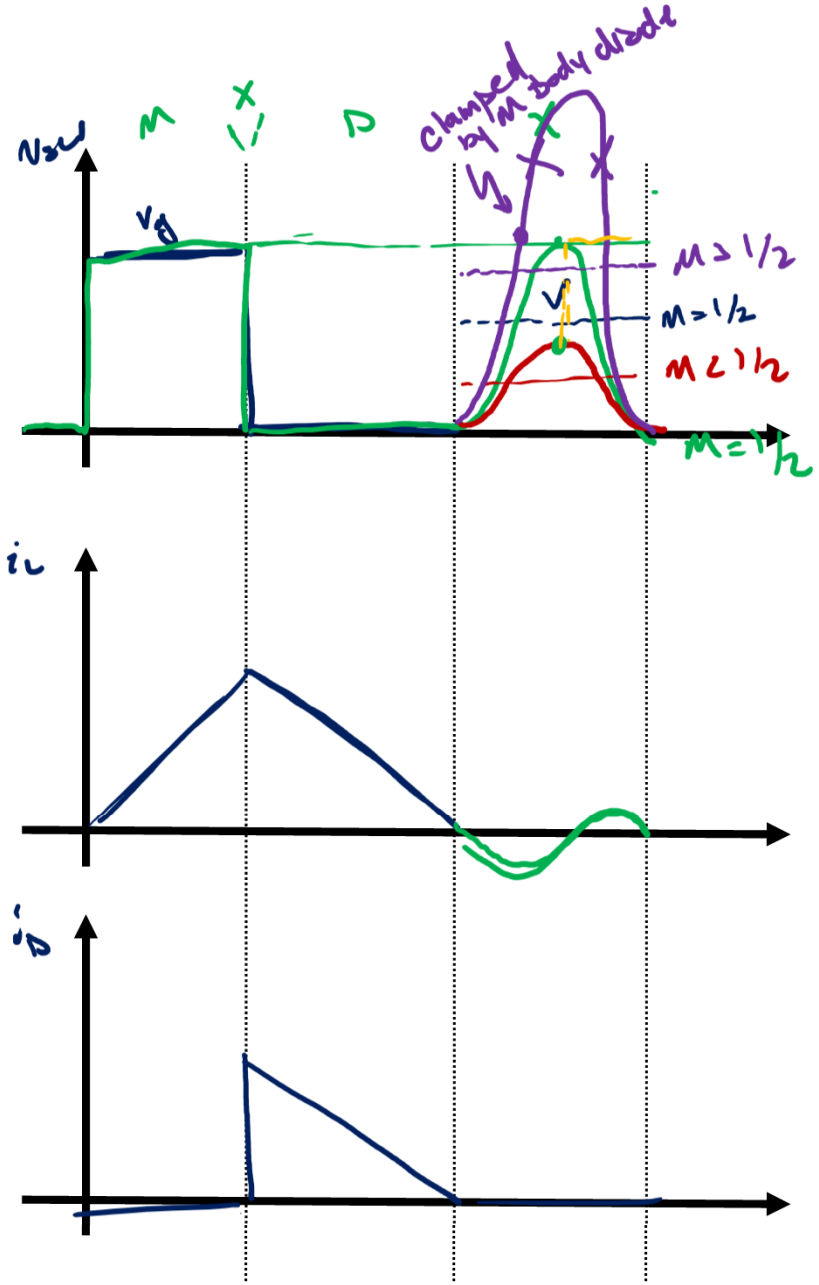
I.C. on 1st Derivatives

$v_L(t=0) \angle \phi$ so $\frac{di}{dt} \angle \phi$

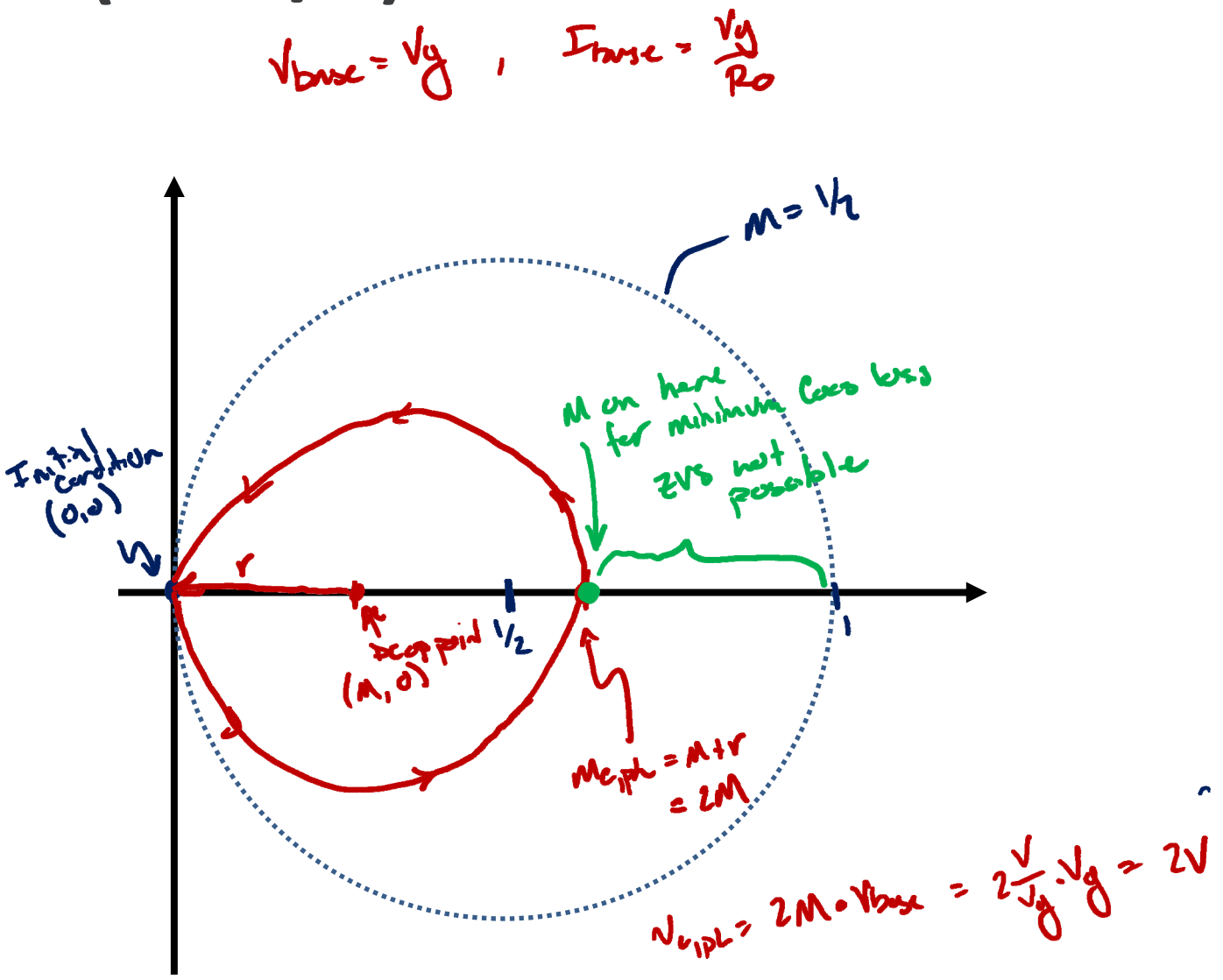


DCM Buck M≠1/2

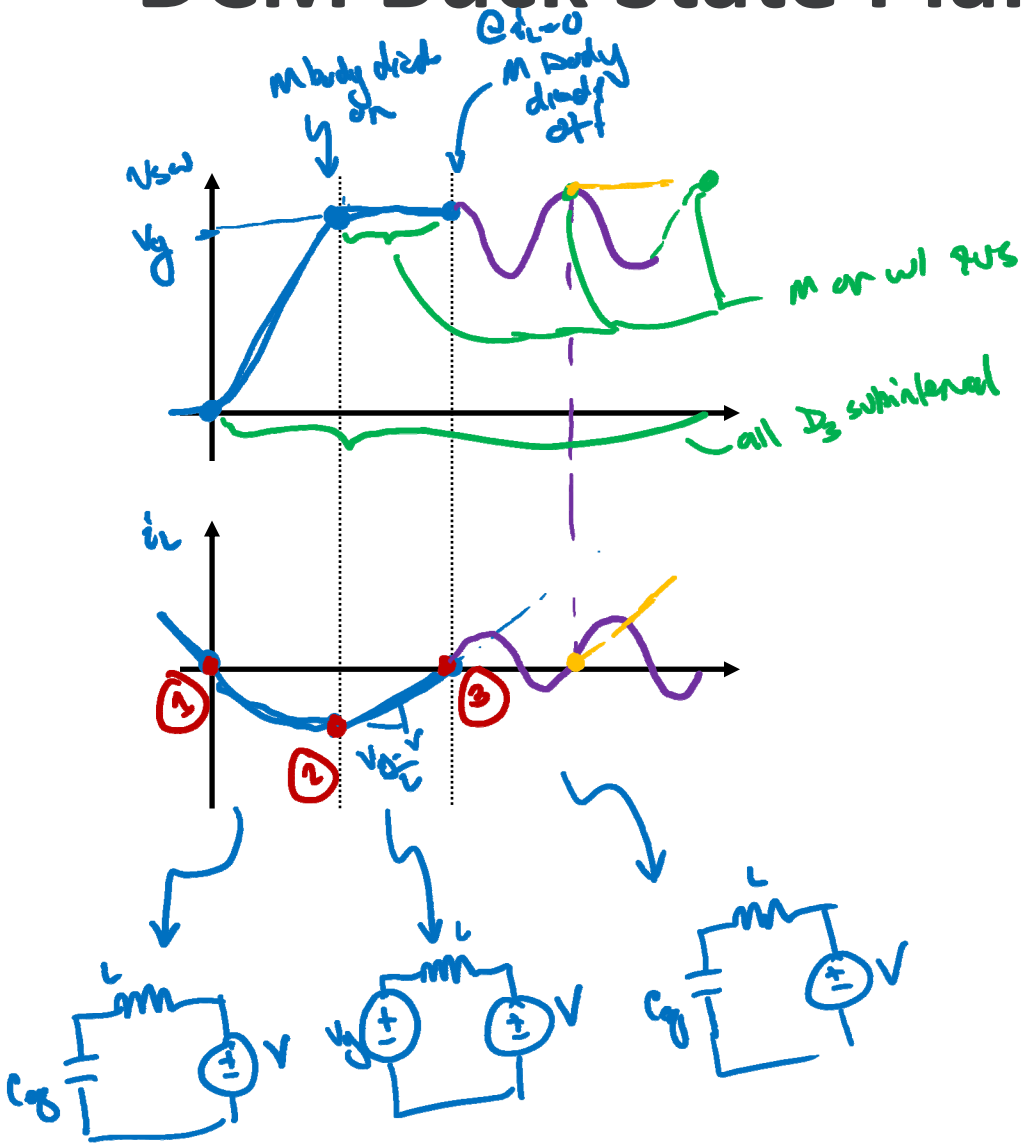


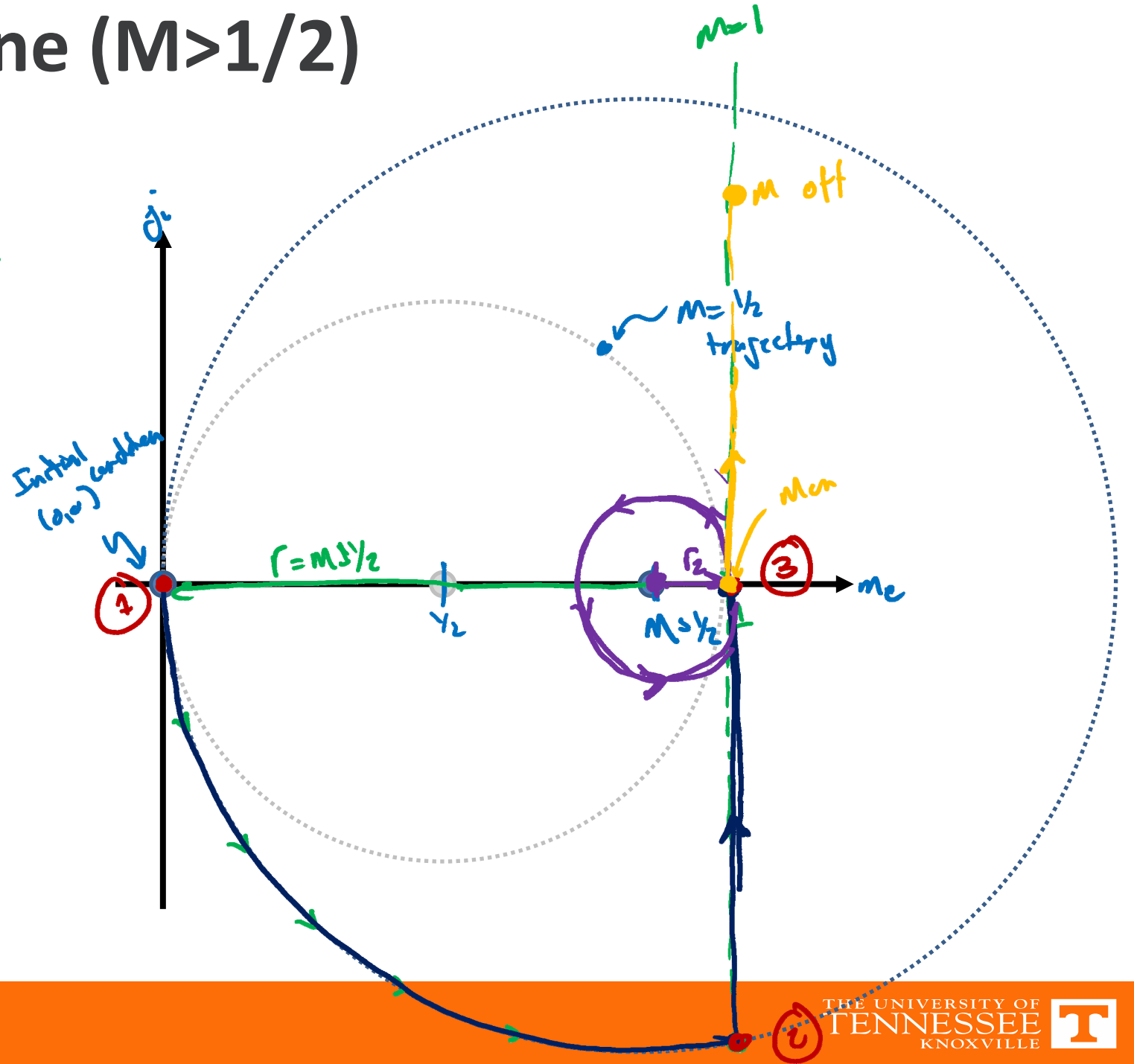


DCM Buck State Plane (M<1/2)



DCM Buck State Plane (M>1/2)





Synchronous Buck Converter