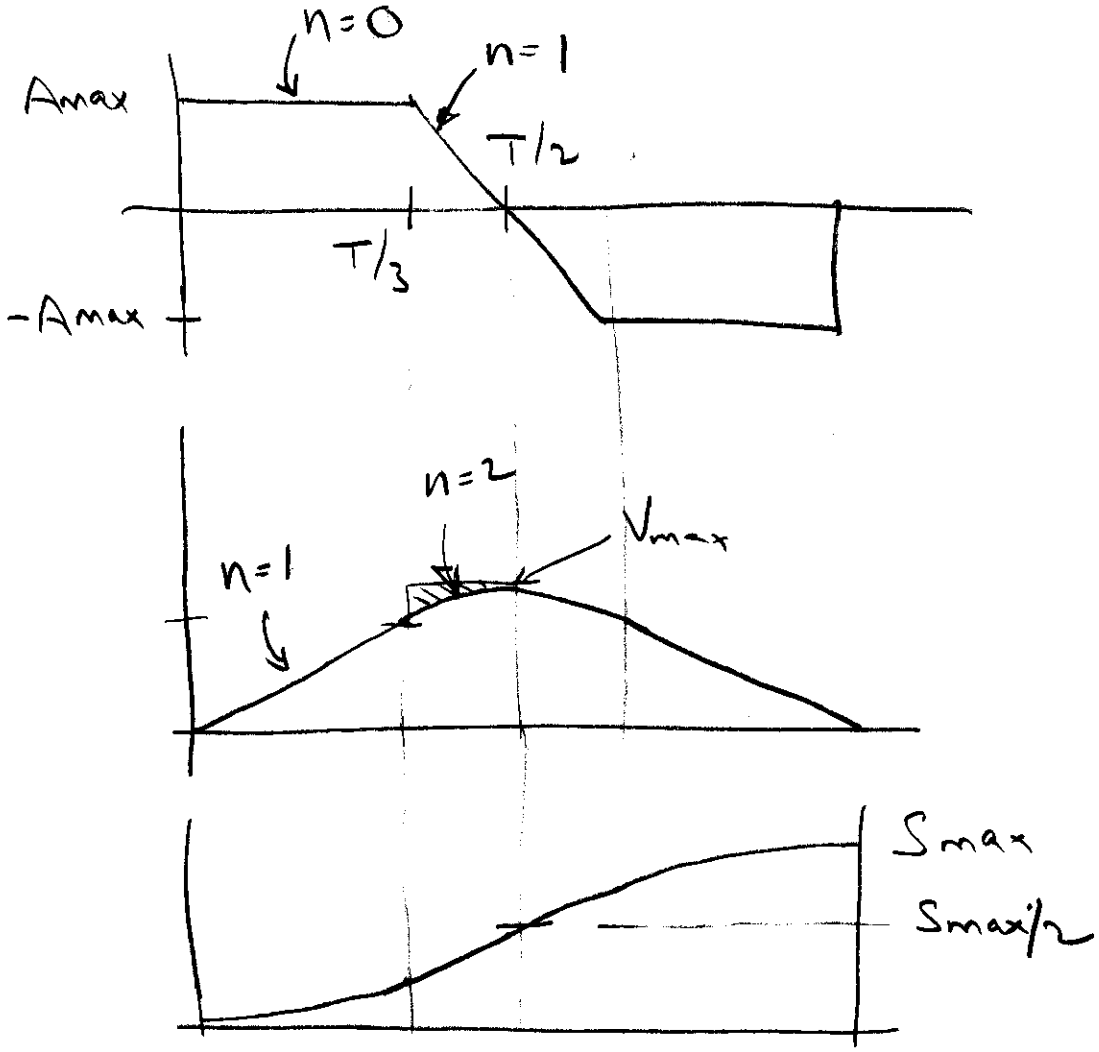
#1



$$V(T/3) = \frac{(A_{max})(T/3)}{1+0} = \frac{A_{max}T}{3}$$

$$V_{max} = \frac{1}{2}A_{max}\left(\frac{T}{2}+\frac{T}{3}\right) = \frac{5A_{max}T}{12}$$

$$S(T/3) = \frac{V(T/3)\,T/3}{1+1} = \frac{\left(\frac{A_{max}T}{3}\right)(T/3)}{2} = \frac{A_{max}T^2}{18}$$

$$S(T/2) = S(T/3) + (V_{max})\left(\frac{T}{2}-\frac{T}{3}\right) - \frac{\left[V_{max}-V(T/3)\right]\left(\frac{T}{2}-\frac{T}{3}\right)}{2+1}$$

$$= \frac{A_{max}T^2}{18} + \left(\frac{5A_{max}T}{12}\right)\left(\frac{T}{6}\right) - \frac{1}{3}\left(\frac{5A_{max}T}{12} - \frac{A_{max}T}{3}\right)\left(\frac{T}{6}\right)$$

$$S(T/2) = \frac{9A_{max}T^2}{72} - \frac{A_{max}T^2}{216} = \frac{26A_{max}T^2}{216} = \frac{13A_{max}T^2}{108}$$

$$S_{max} = 2S(T/2) = \frac{13A_{max}T^2}{54} \qquad S\left(\frac{2T}{3}\right) = S_{max} - S(T/3)$$

0.24074

Problem #2 ME 465 – Homework #8 Solution

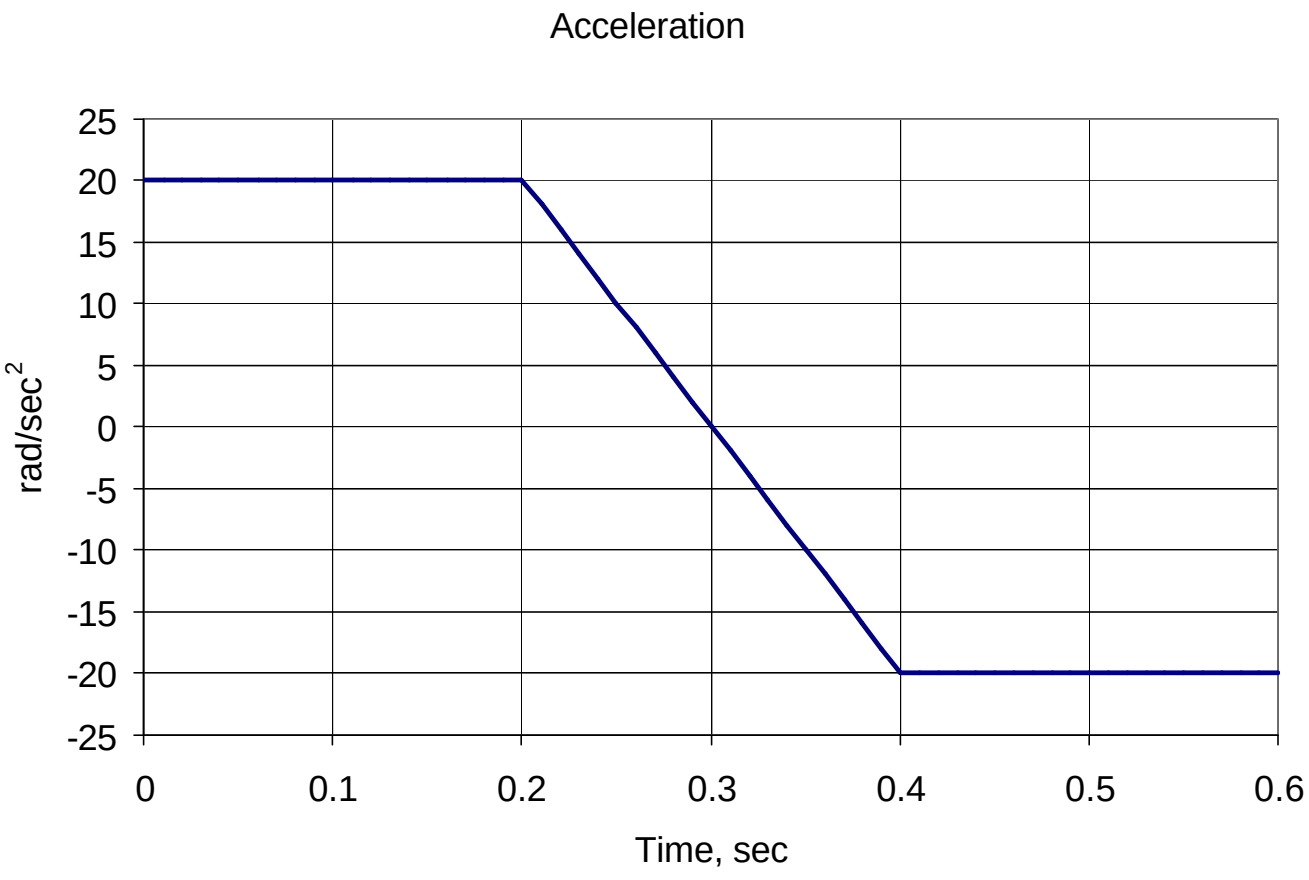
time	Acc	Vel	Disp
0	20	0	0
0.01	20	0.2	0.001
0.02	20	0.4	0.004
0.19	20	3.8	0.361
0.2	20	4	0.4
0.21	18	4.19	0.44095
"	"	"	"
0.29	2	4.99	0.81655
0.3	0	5	0.8665
0.31	-2	4.99	0.91645
"	"	"	"
0.39	-18	4.19	1.29205
0.4	-20	4	1.333
0.41	-20	3.8	1.372
"	"	"	"
0.59	-20	0.2	1.732
0.6	-20	-4.4E-16	1.733

$$V\left(\frac{T}{3}\right)=\frac{A_{\max}T}{3}=\frac{\left(20\frac{rad}{\sec^2}\right)(0.6\sec)}{3}=4\frac{rad}{\sec}$$

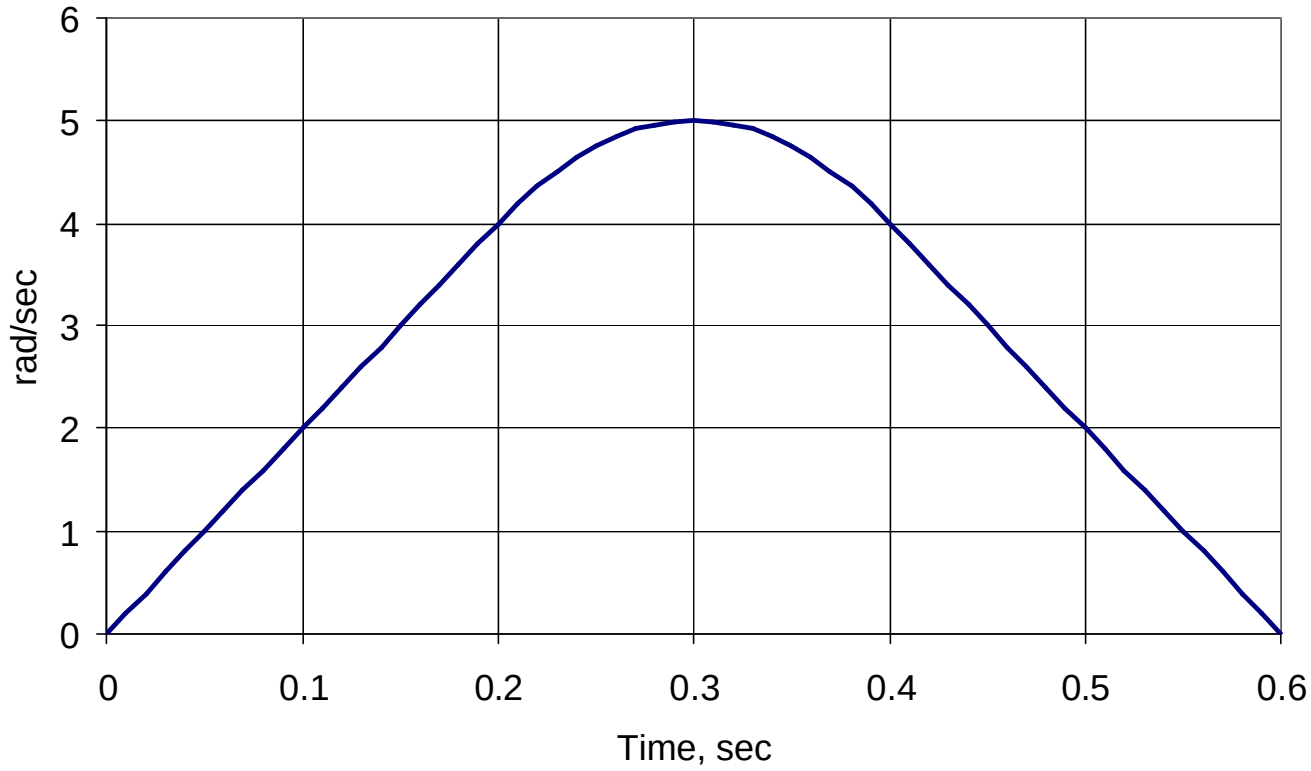
$$V_{\max}=\frac{5A_{\max}T}{12}=\frac{5\left(20\frac{rad}{\sec^2}\right)(0.6\sec)}{12}=5\frac{rad}{\sec}$$

$$S\left(\frac{T}{3}\right)=\frac{A_{\max}T^2}{18}=\frac{\left(20\frac{rad}{\sec^2}\right)(0.6\sec)^2}{18}=0.4rad$$

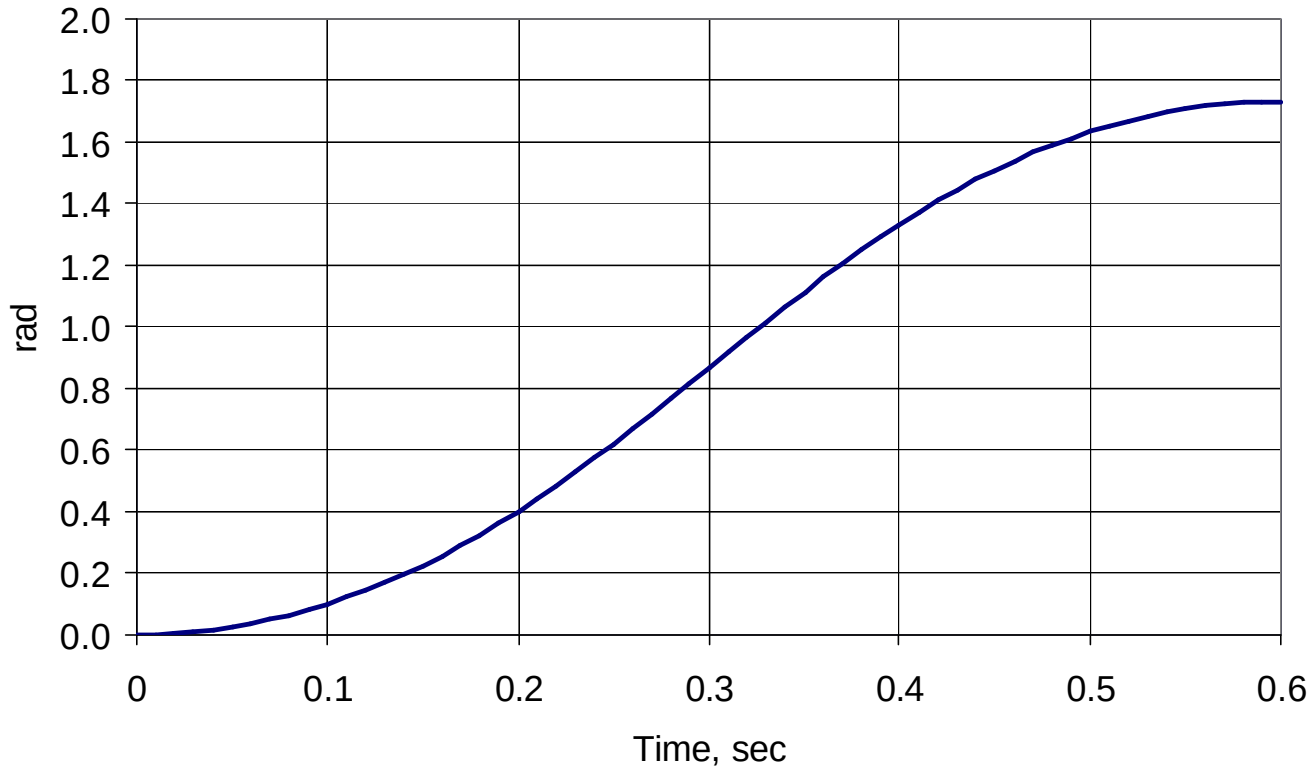
$$S_{\max}=\frac{13A_{\max}T^2}{54}=\frac{13\left(20\frac{rad}{\sec^2}\right)(0.6\sec)^2}{54}=1.7333rad$$



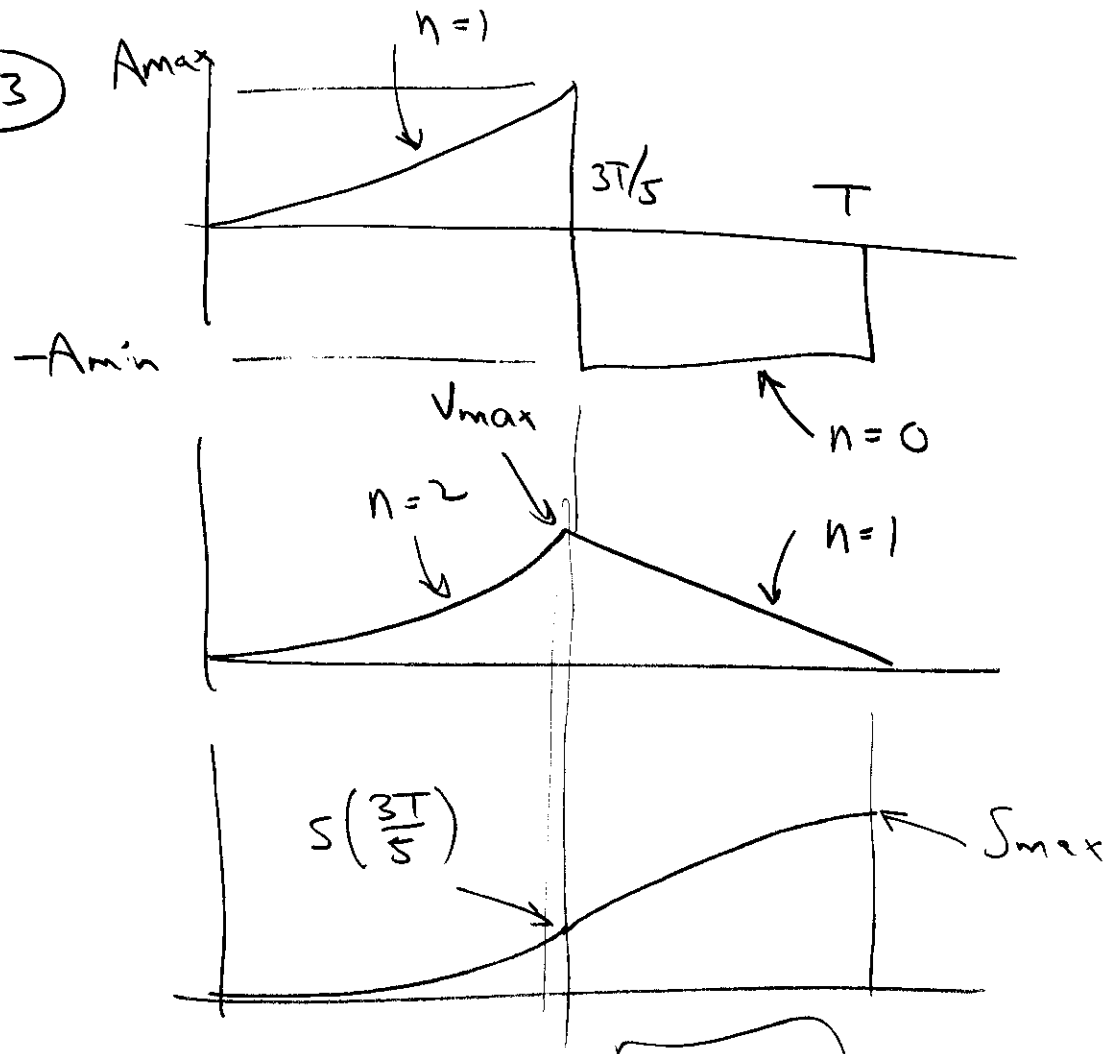
Velocity



Displacement



#3



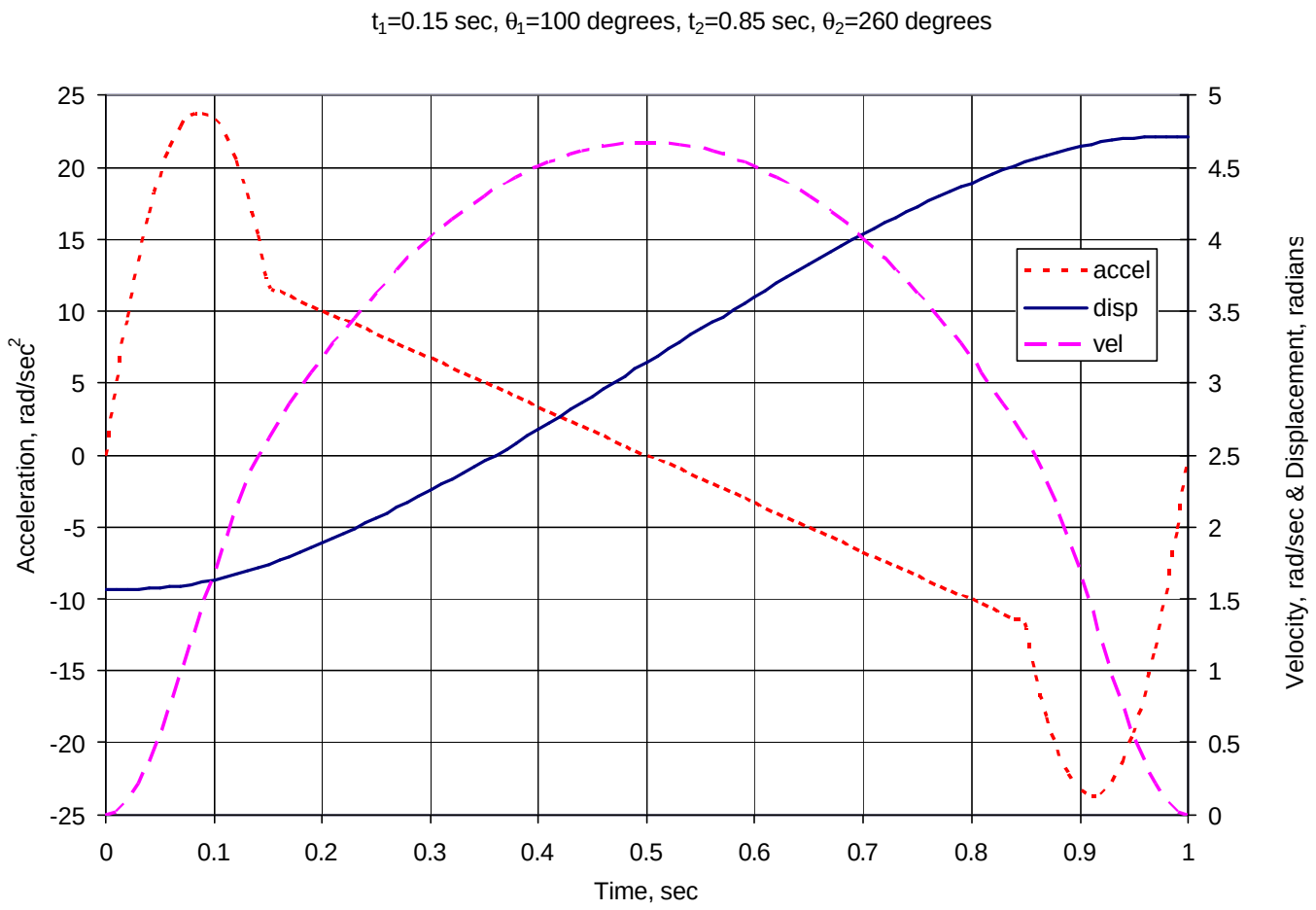
$$V_{max} = \frac{(A_{max})(\frac{3T}{5})}{1+1} = \boxed{\frac{3A_{max}T}{10}} = \frac{-A_{min}(2T/5)}{0+1} = \frac{-2TA_{min}}{5}$$

$$\rightarrow A_{min} = \frac{-5(3A_{max})}{2(10)} = \frac{-3}{4}A_{max}$$

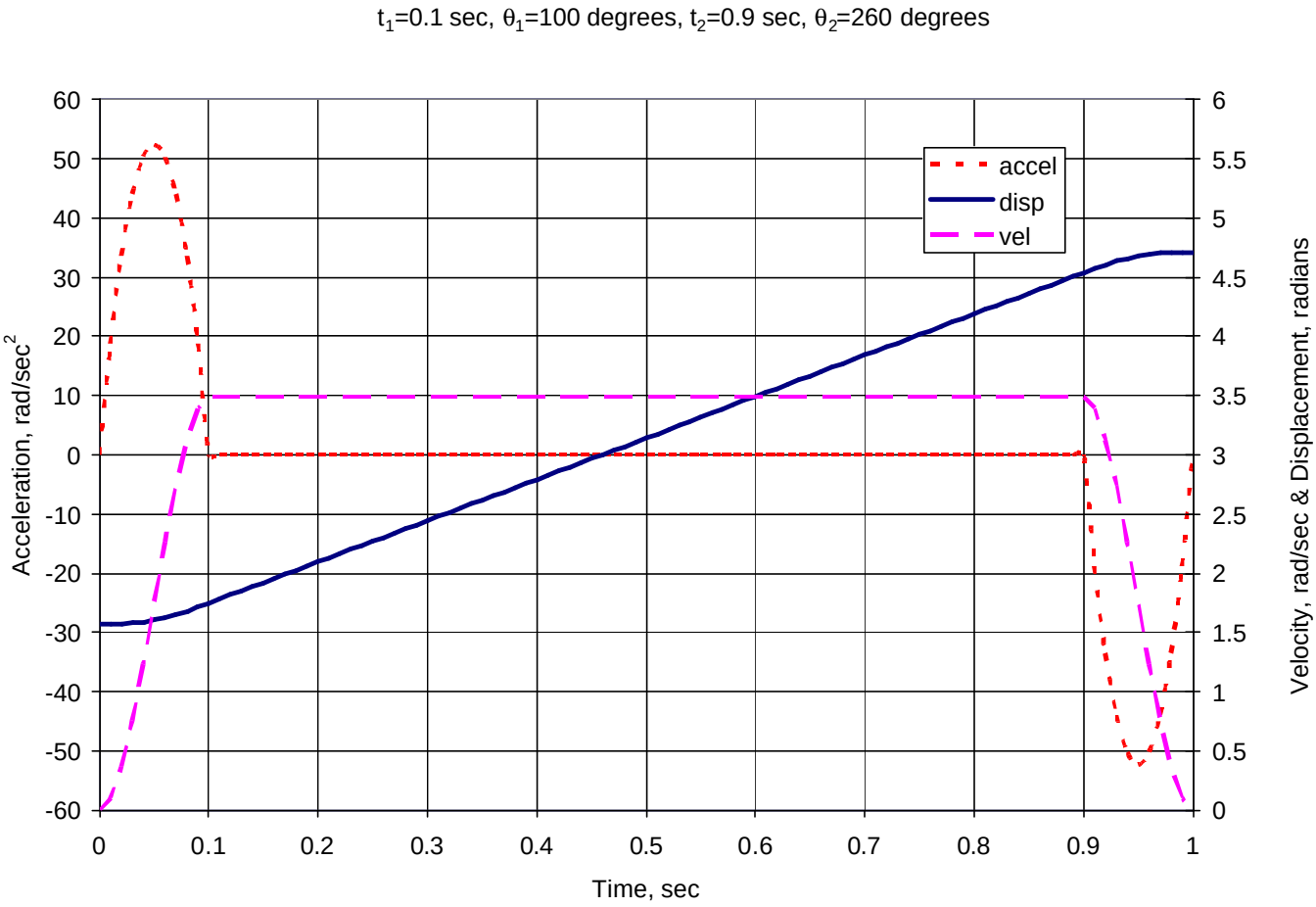
$$s\left(\frac{3T}{5}\right) = \frac{(V_{max})(3T/5)}{2+1} = \frac{1}{3}\left(\frac{3A_{max}T}{10}\right)\left(\frac{3T}{5}\right) = \frac{3A_{max}T^2}{50}$$

$$S_{max} = s\left(\frac{3T}{5}\right) + \frac{(V_{max})(2T/5)}{1+1} = \frac{3A_{max}T^2}{50} + \frac{1}{2}\left(\frac{3A_{max}T}{10}\right)\left(\frac{2T}{5}\right)$$

$$\boxed{S_{max} = \frac{3A_{max}T^2}{25}}$$

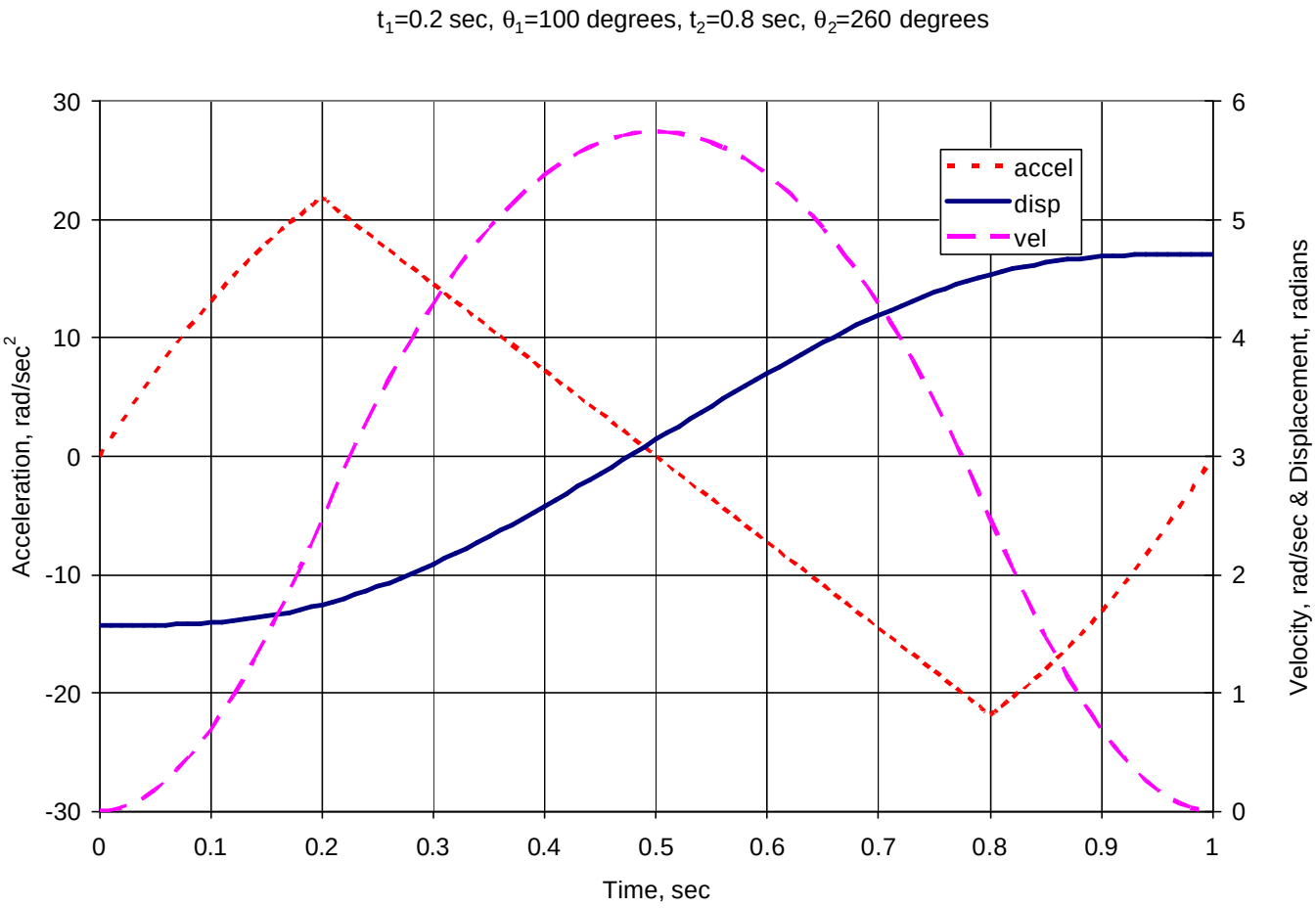


a14	-257.843
a13	90.390
a12	0.000
a11	0.000
a10	1.571
a23	-5.587
a22	8.381
a21	0.483
a20	1.503
a34	257.843
a33	-940.982
a32	1275.888
a31	-760.202
a30	172.165



a14	-1745.329
a13	349.066
a12	0.000
a11	0.000
a10	1.571
a23	0.000
a22	0.000
a21	3.491
a20	1.396
a34	1745.329
a33	-6632.251
a32	9424.778
a31	-5934.119
a30	1400.976

NOT a great solution!
High initial & final accelerations



a14	-18.181
a13	25.453
a12	0.000
a11	0.000
a10	1.571
a23	-12.120
a22	18.181
a21	-3.345
a20	1.784
a34	18.181
a33	-47.269
a32	32.725
a31	3.636
a30	-2.560

Another potential “good” solution – slightly lower accelerations