

Lab work #2

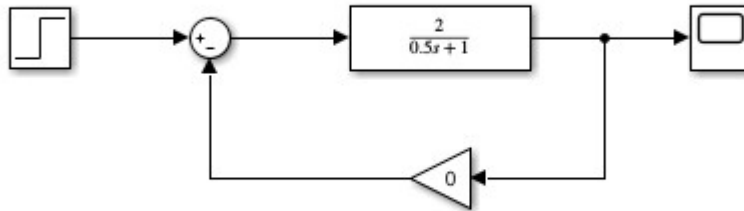
First-order system with feedback

$$W_1 = \frac{k}{T_{EQ} + 1} = \frac{2}{0.5 + 1} = 1.33$$

$$W_f(s) = 0$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1} = 2.00$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1} = 0.5$$

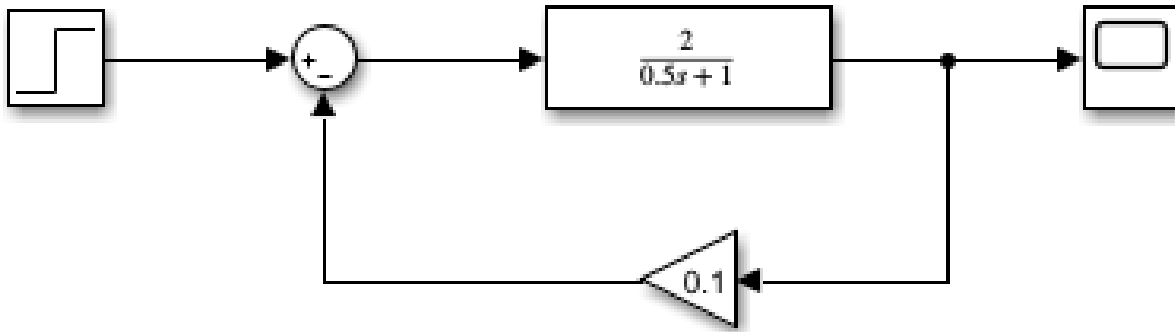


$$W_2 = \frac{k}{T_s + 1} = 1.43$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0.1} = 1.6666$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0.1} = 0.1613$$

$$W_f(s) = 0.1$$

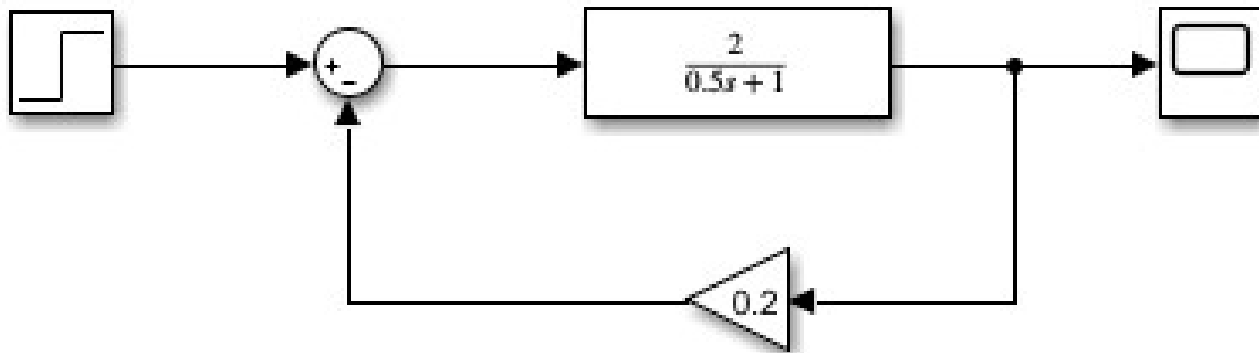


$$W_3 = \frac{k}{T_s + 1} = 1.0538$$

$$W_f(s) = 0.2$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0.2} = 1.43$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0.2} = 0.357$$

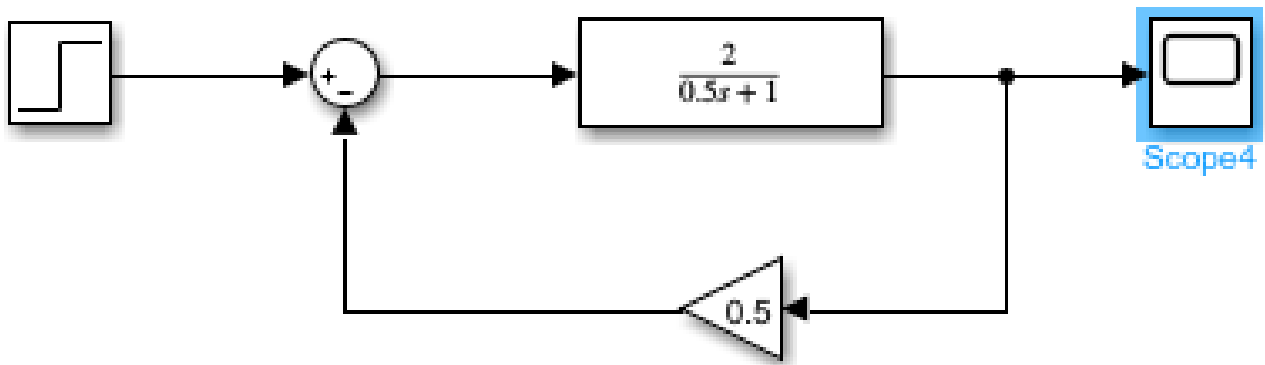


$$W_4 = \frac{k}{T_s + 1} = 0.8$$

$$W_f(s) = 0.5$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0.5} = 1$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0.5} = 0.25$$

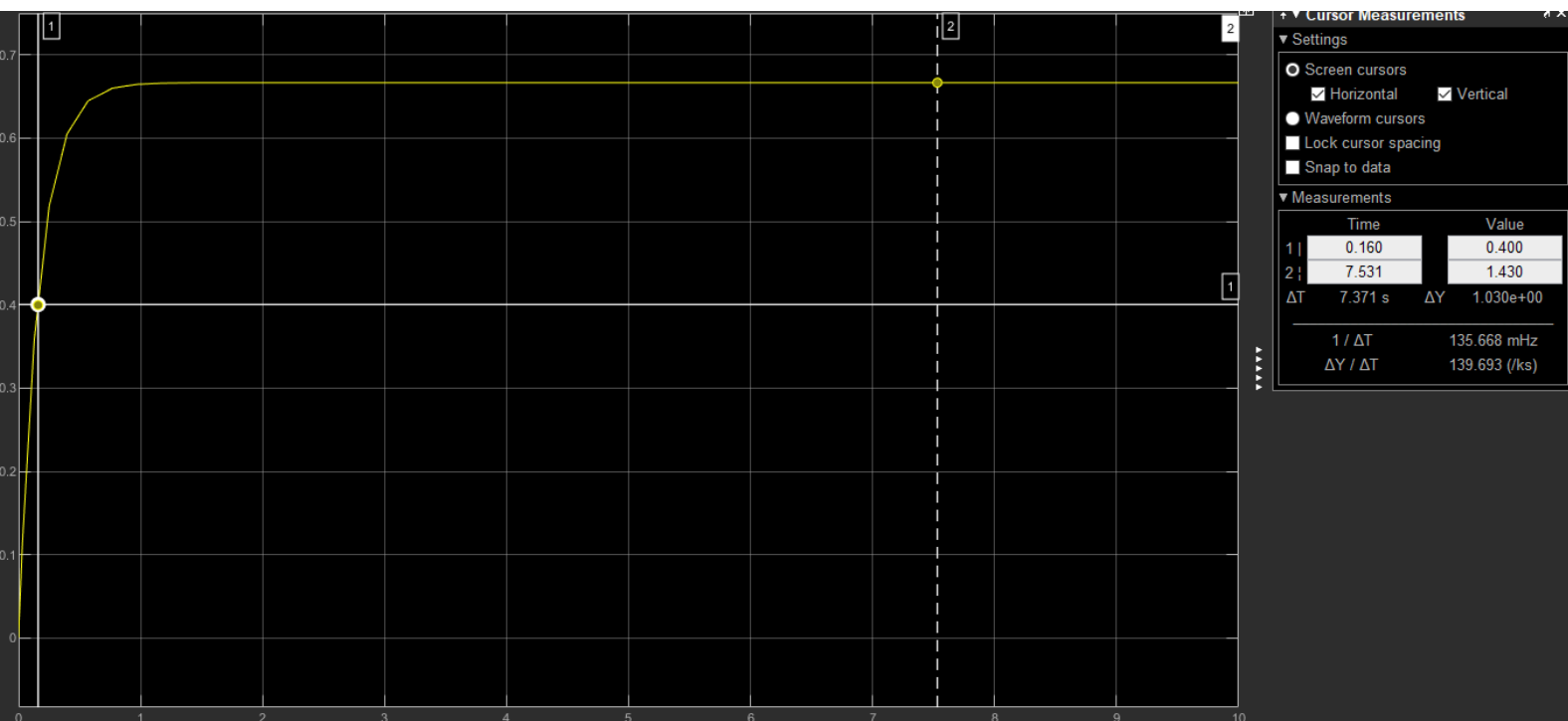
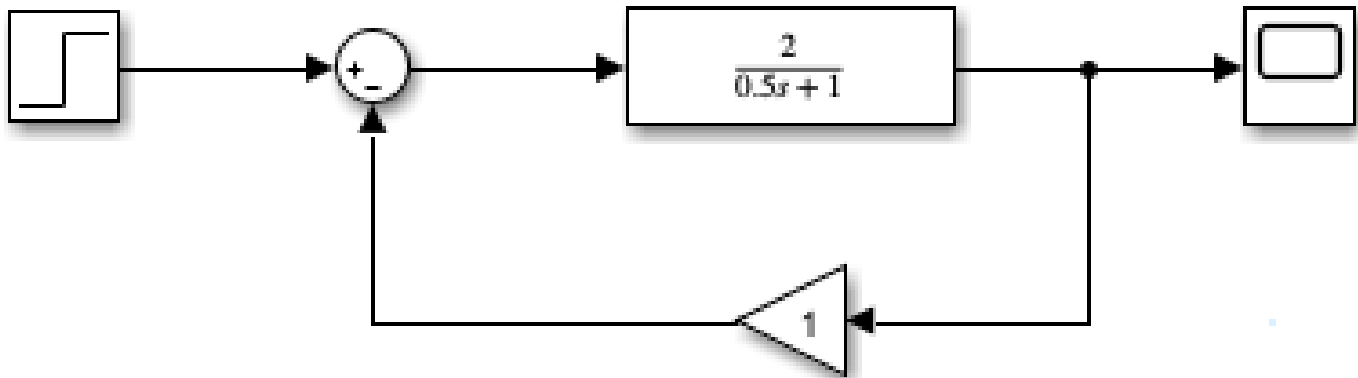


$$W_5 = \frac{k}{T_s + 1} = 0.566038$$

$$W_f(s) = 1$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 1} = 0.666$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 1} = 0.166$$



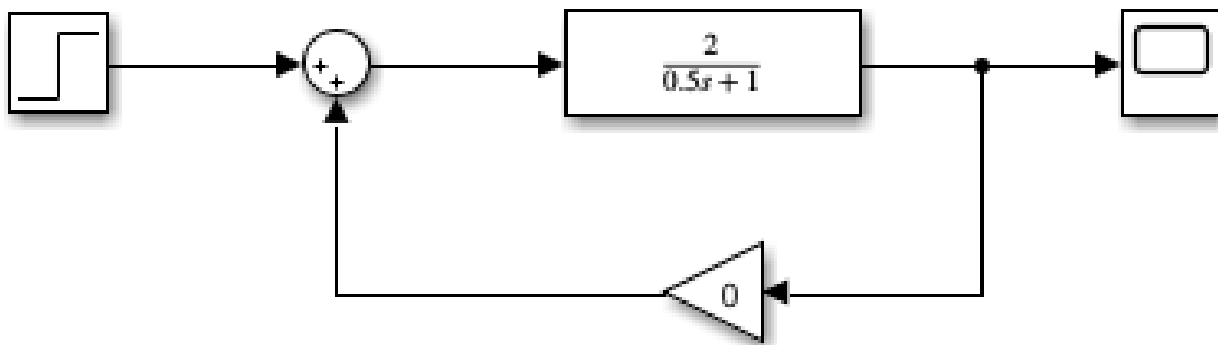
For Positive Feedback

$$W_1 = \frac{k}{T_s + 1} = 1.33$$

$$W_f(s) = 0$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0} = 2$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0} = 0.5$$

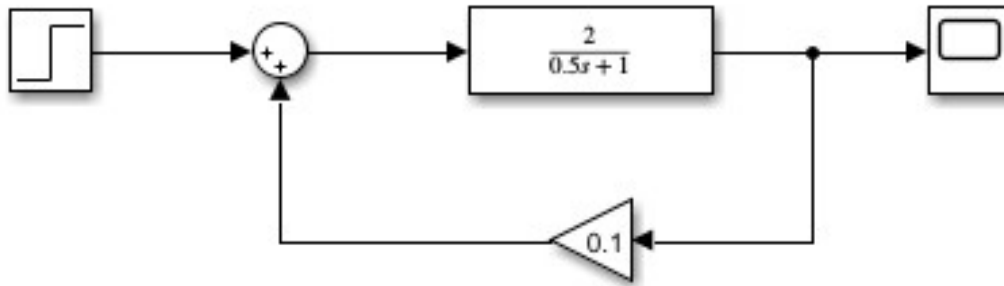


$$W_2 = \frac{k}{T_s + 1} = 1.43$$

$$W_f(s) = 0.1$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0.1} = 1.666$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0.1} = 0.1613$$

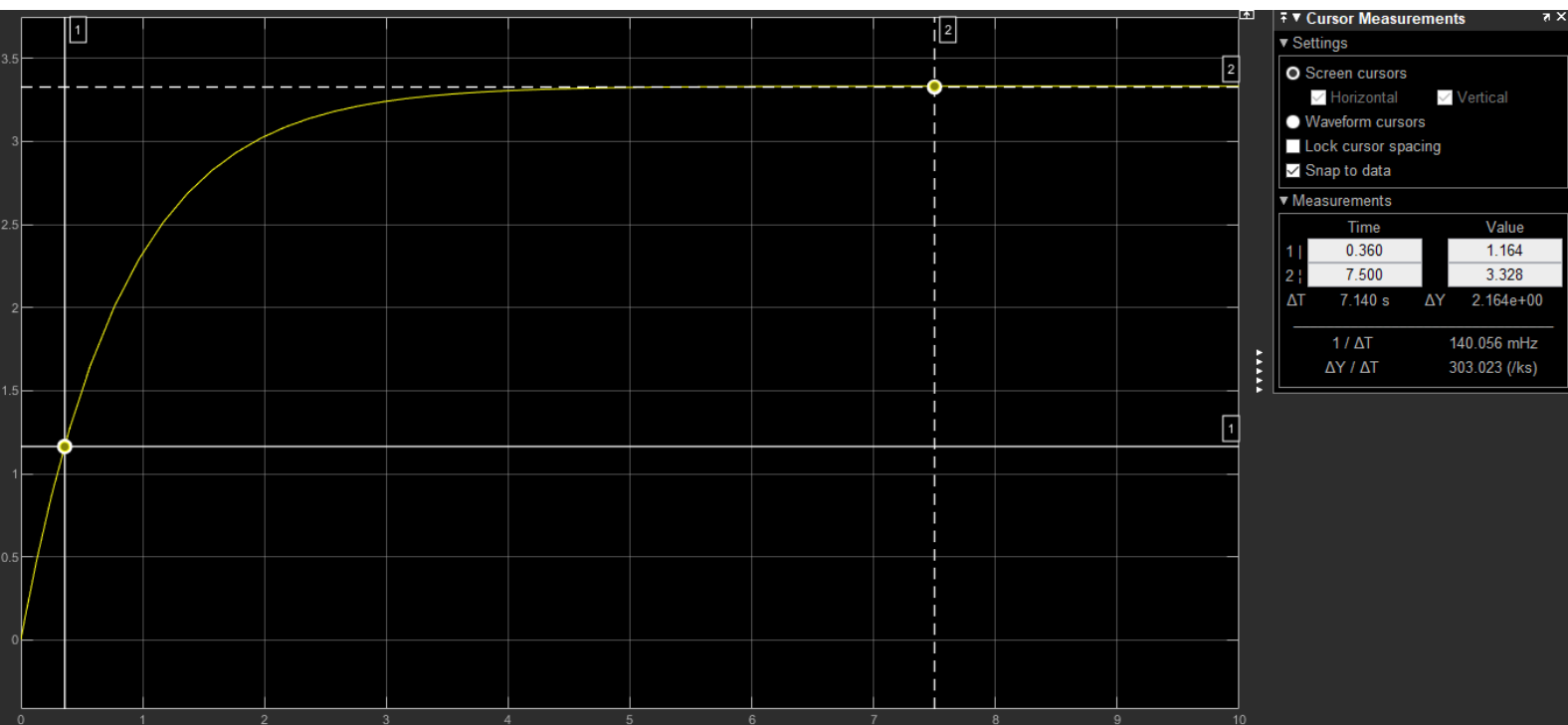
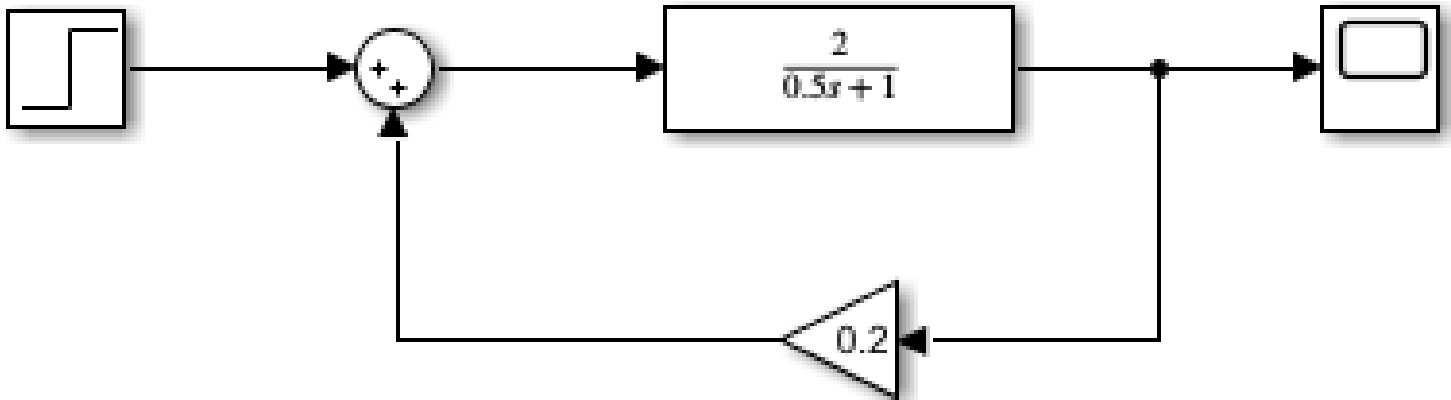


$$W_3 = \frac{k}{T_s + 1} = 1.05$$

$$W_f(s) = 0.2$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0.2} = 1.43$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0.2} = 0.36$$

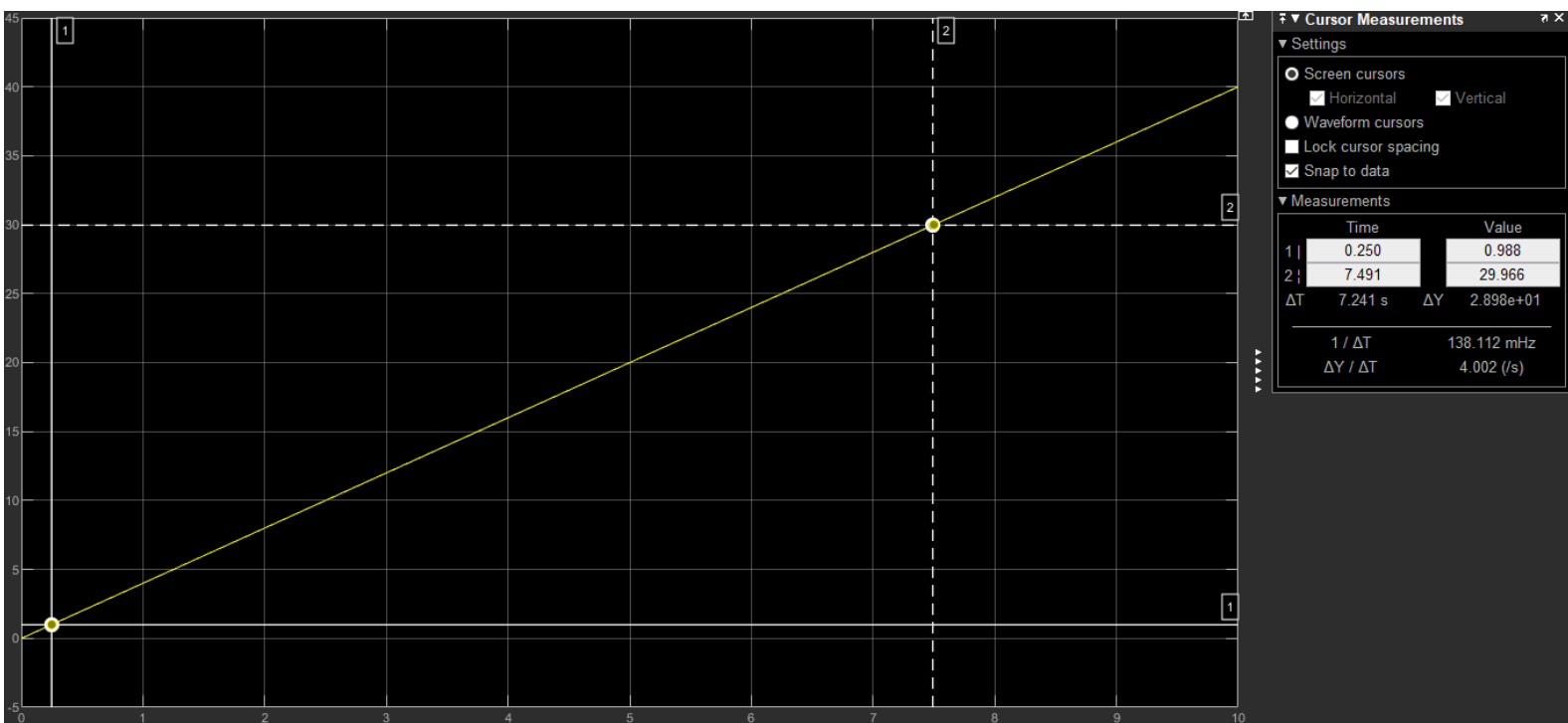
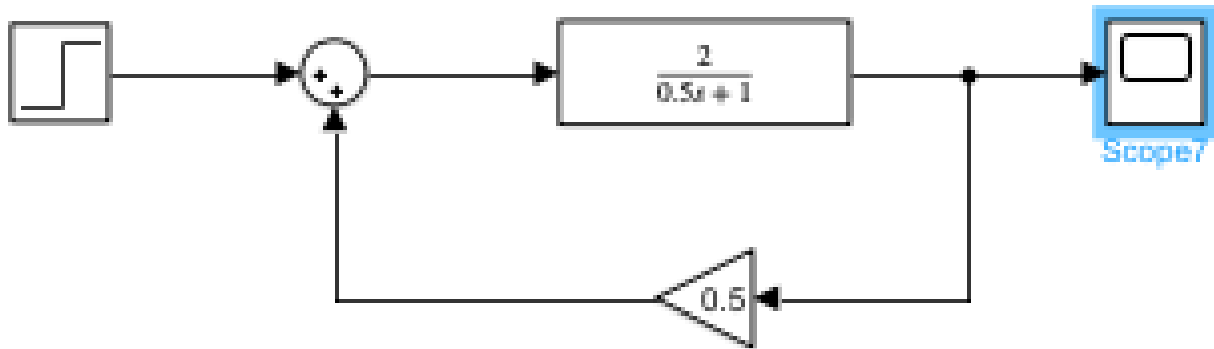


$$W_4 = \frac{k}{T_s + 1} = 0.8$$

$$W_f(s) = 0.5$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 0.5} = 1$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 0.5} = 0.25$$

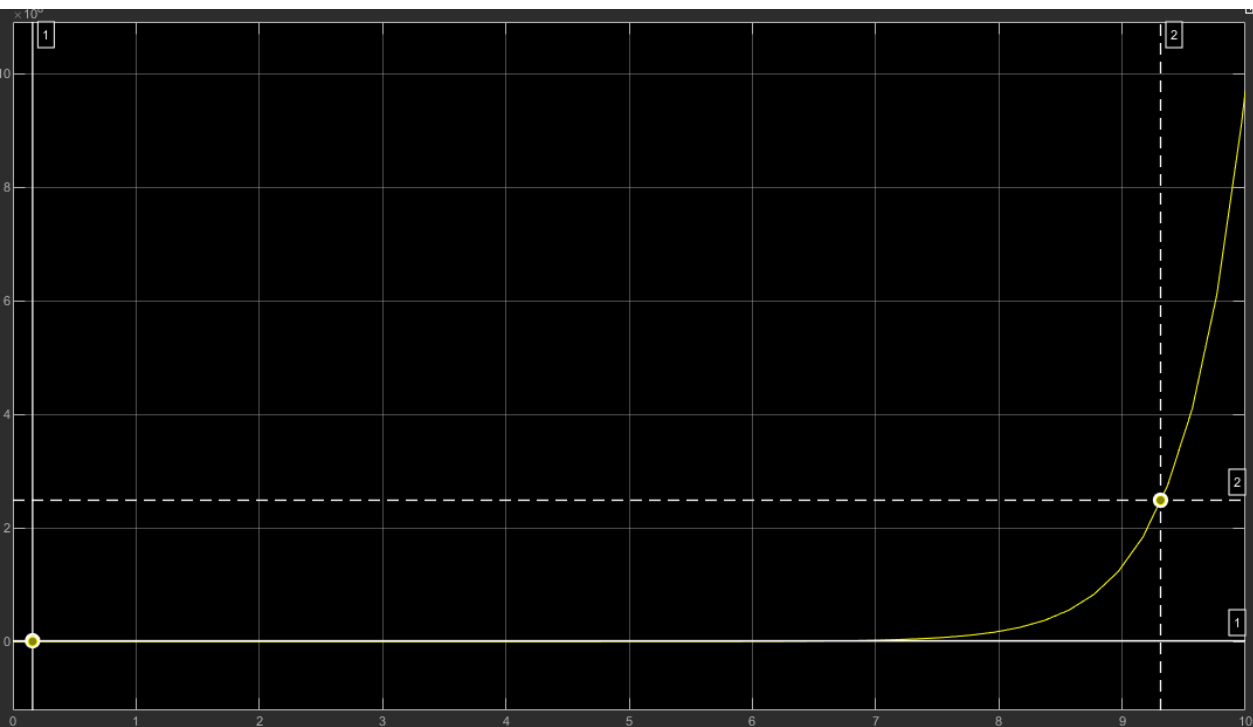
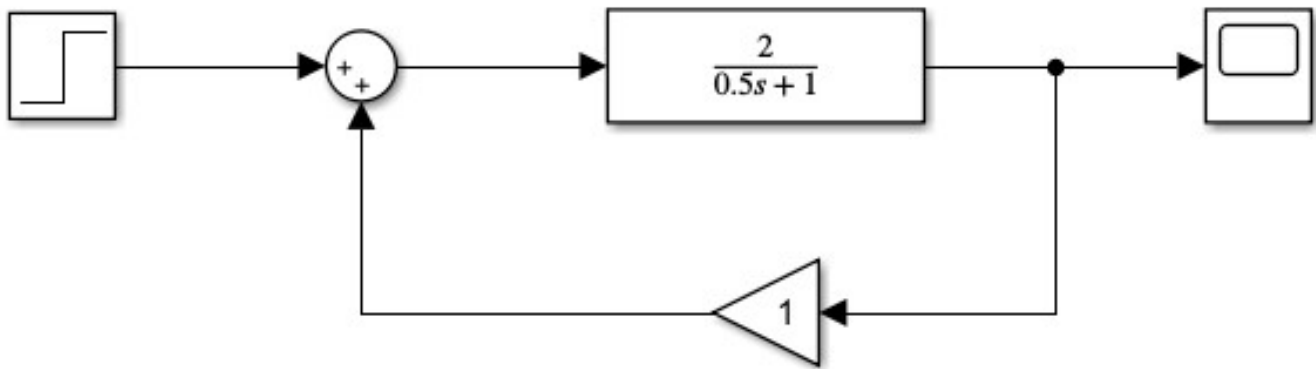


$$W_5 = \frac{k}{T_s + 1} = 0.569$$

$$K_{EQ} = \frac{k}{1 + k * k_F} = \frac{2}{1 + 2 * 1} = 0.66$$

$$W_f(s) = 1$$

$$T_{EQ} = \frac{T}{1 + k * k_F} = \frac{0.5}{1 + 2 * 1} = 0.16$$



Cursor Measurements		
Settings		
Screen cursors		
<input checked="" type="checkbox"/> Horizontal <input checked="" type="checkbox"/> Vertical		
Waveform cursors		
<input type="checkbox"/> Lock cursor spacing		
<input checked="" type="checkbox"/> Snap to data		
Measurements		
	Time	Value
1	0.160	1443980.800
2	9.312	2.490e+08
ΔT	9.152 s	ΔY 2.475e+08
1 / ΔT		109.264 mHz
ΔY / ΔT		27.047 (μs)

Negative Feedback			
Evaluated		Calculated	
Keq	Teq	Keq	Teq
2	0.55	2	0.5
1.66	0.798	1.66	0.1613
1.43	0.49	1.43	0.357
1.43	0.44	1	0.25
1.43	0.328	0.666	0.166

Positive Feedback			
Evaluated		Calculated	
Keq	Teq	Keq	Teq
2	0.547	2	0.5
2.5	0.538	1.66	0.1613
3.328	0.36	1.43	0.36
29.966	0.25	1	0.25
2.49E+08	0.17	0.66	0.16