

# ECE 461/661 Handout #22

## Gain Compensation

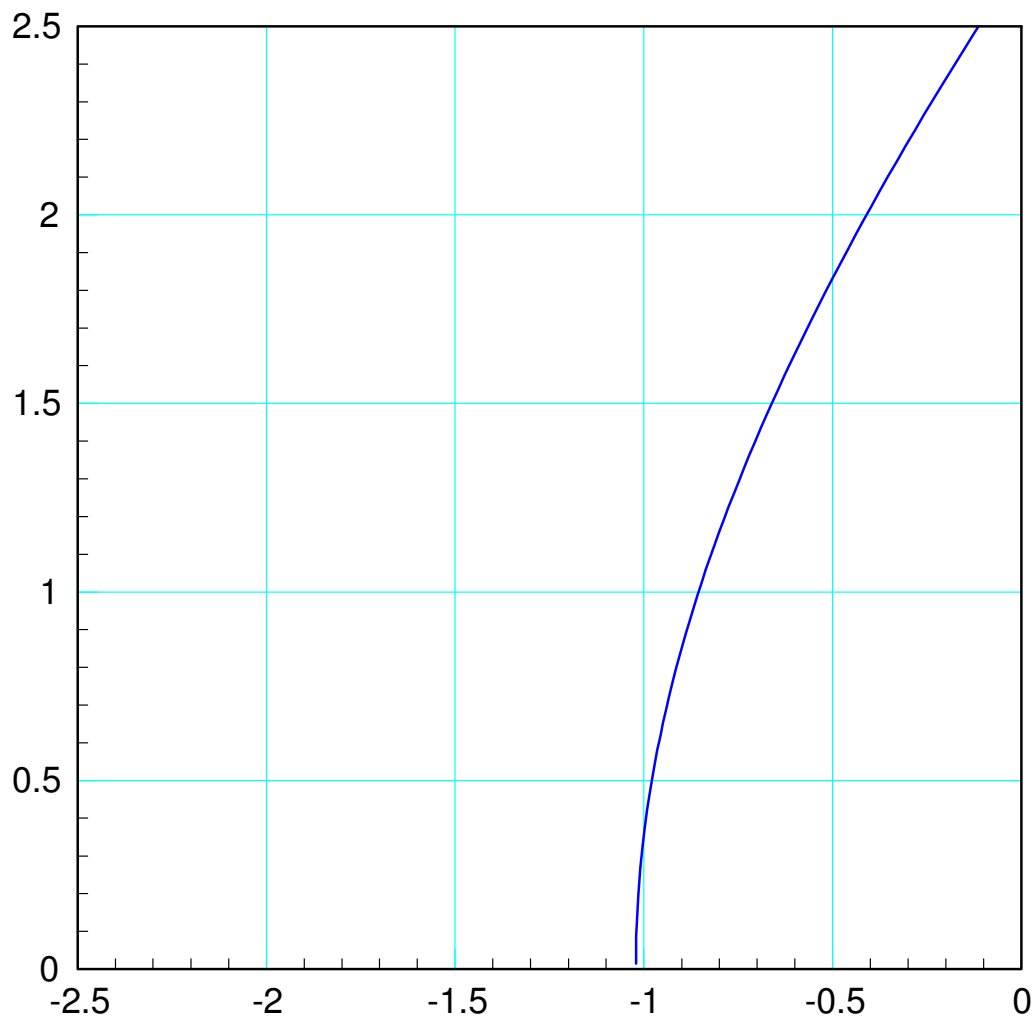
The root locus for  $G(s)$  is given below

$$G(s) = \left( \frac{200}{(s+0.3)(s+2)(s+5)(s+10)} \right)$$

Determine the gain,  $k$ , that results in 20% overshoot in the step response

Closed-Loop dominant pole	k	Resulting $K_p$

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## Solution

$$G(s) = \left( \frac{200}{(s+0.3)(s+2)(s+5)(s+10)} \right)$$

Closed-Loop dominant pole	k	Resulting Kp
<b>s = -0.703 + j1.406</b>	<b>0.595</b>	<b>3.693</b>

$$\left( \frac{200}{(s+0.3)(s+2)(s+5)(s+10)} \right)_{s=-0.703+j1.406} = 1.682 \angle 180^\circ$$

$$k = \frac{1}{1.682} = 0.595$$

$$K_p = (GK)_{s=0} = \left( \frac{200k}{(s+0.3)(s+2)(s+5)(s+10)} \right)_{s=0} = 3.693$$

