start at $n=0$:

initial conditions

$$y[0] = a_1 \boxed{y[-1]} + a_2 \boxed{y[-2]} + \boxed{b_0 x[0]} + \boxed{b_1 x[-1]} + \boxed{b_2 x[-2]}$$

slide 11-9

$$H(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2}}{1 - a_1 z^{-1} - a_2 z^{-2}} \cdot \frac{z^2}{z^2} = \frac{b_0 z^2 + b_1 z + b_2}{z^2 - a_1 z - a_2} = b_0$$

$$= b_0 \frac{z^2 + \left(\frac{b_1}{b_0}\right) z + \left(\frac{b_2}{b_0}\right)}{z^2 - a_1 z - a_2} = b_0 \frac{(z - z_0)(z - z_1)}{(z - p_0)(z - p_1)}$$

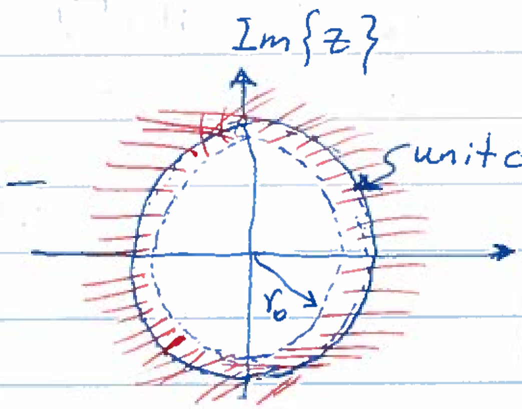
$|z| > |p_0|$ $|z| > |p_1|$

$\Downarrow$

Region of convergence $|z| > |p_0|$ and $|z| > |p_1|$

$\Downarrow$

$|z| > \max\{|p_0|, |p_1|\}$



$r_0 = \max\{|p_0|, |p_1|\}$

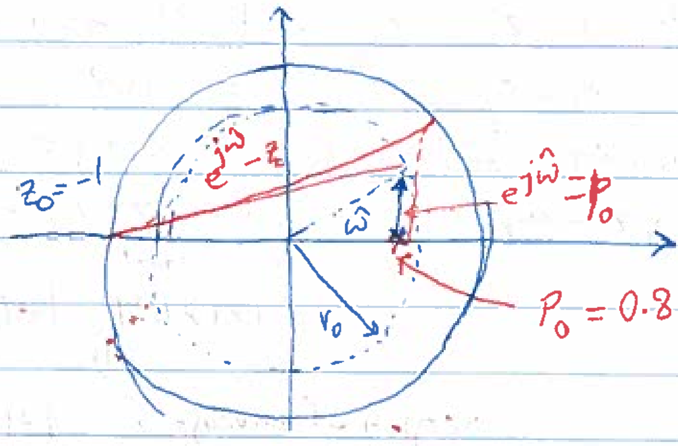
$$H(z) = b_0 \frac{(z - z_0)(z - z_1)}{(z - p_0)(z - p_1)} = b_0 \frac{z^2 - (z_0 + z_1) z + z_0 z_1}{z^2 - (p_0 + p_1) z + p_0 p_1} \cdot \frac{z^{-2}}{z^{-2}}$$

$$= \frac{1 - (z_0 + z_1) z^{-1} + z_0 z_1 z^{-2}}{1 - (p_0 + p_1) z^{-1} + p_0 p_1 z^{-2}} \cdot b_0$$

$$|ab| = |a|\,|b| \quad , \quad \measuredangle ab = \measuredangle a + \measuredangle b$$

$$a = r_a e^{j\theta_a} \quad , \quad b = r_b e^{j\theta_b}$$

$$ab = (r_a r_b)\, e^{j(\theta_a + \theta_b)} \quad , \quad |e^{j\theta}| = 1 = \sqrt{\cos^2\theta + \sin^2\theta}$$



$$H(z) = \frac{z - z_0}{p - p_0}$$

$\hat{\omega}$	$H(e^{j\hat{\omega}})$
0	$\frac{2}{0.2} = 10$
π	0
$\frac{\pi}{2}$	$\frac{\sqrt{2}}{1.28} = 1.1$