

$$3.4 \text{ (a)} \quad \varphi(z) = 1 - 0.8z + 0.15z^2$$

The roots are $\{2, 10/3\}$

$$\theta(z) = 1 - 0.3z$$

The root is $10/3$.

Eliminating the redundant root,
we get

$$\text{ARMA}(1, 0) \begin{cases} \varphi(z) = 1 - z/2 & z_0 = 2 \\ \theta(z) = 1 & \end{cases}$$

This is both causal & invertible.

$$(b) \quad \varphi = 1 - z + \frac{1}{2}z^2 \quad z_1 = 1+i, \quad z_2 = 1-i$$

$$\theta = 1 - z, \quad z_0 = 1$$

ARMA(2, 1).

Causal but not invertible.