Time Series Analysis - Test 1

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Instructions:
All questions carry **three marks**. Question 1 is compulsory.
Answer **any one** question from Questions 2 and 3.
Time limit is 40 minutes.

1. Consider
$$m_t = -0.3\, m_{t-1} + w_t, \qquad m_{-1} = 0.$$
   (a) Plot the impulse response function of the system as a bar graph.
   (b) Suppose
$$w_0 = 1, \qquad w_1 = -2, \qquad w_t = 0 \text{ for } t \geq 2.$$
   Give a formula for m_t for general $t \geq 0$.

2. Inflation is assumed to adjust gradually over time. Consider
$$\pi_t = \gamma \pi_{t-1} - \tfrac{1}{2}\gamma^2 \pi_{t-2} - \kappa u_t, \qquad \gamma \in \mathbb{R},$$
   where unemployment u_t is exogenous.

   Prove or disprove: the system is stable for all values of γ.

3. Let
$$F = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}.$$
   Compute the $(1,1)$ entry of F^4. [Hint: Easier to work with difference equation directly.]