

# MathQuest: Difference Equations

## Classifying Difference Equations

1. The equation  $a_{n+1} = na_n + a_n a_{n-1} + n^3$  is nonlinear. Which term makes it nonlinear?
  - (a)  $na_n$
  - (b)  $a_n a_{n-1}$
  - (c)  $n^3$
  - (d) All of the above
  
2. What is the order of the difference equation  $a_{n+5} = 3a_{n+1} + a_{n+2} + 5$ ?
  - (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
  - (e) 5
  - (f) 6
  
3. How many initial conditions are needed to fully specify the sequence described by a 4th order difference equation?
  - (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
  - (e) 5
  
4. Which of the following difference equations is nonhomogeneous?
  - (a)  $a_{n+1} = 3a_n$
  - (b)  $b_{n+2} = 5b_n b_{n-1}$
  - (c)  $c_{n+1} = 4c_n + 5n$
  - (d)  $d_{n+1} = 3d_n + d_{n-2}$
  - (e) More than one of the above is nonhomogeneous.
  - (f) None of the above are nonhomogeneous.