MathQuest: Difference Equations

Testing Analytical Solutions

1. We want to test the solution $a_n = 5 \cdot 4^n$ in the difference equation $a_{n+1} = 4a_n$. What equation results from substituting the solution into the difference equation?

   (a) $5 \cdot 4^n = 4 \cdot 5 \cdot 4^n$

   (b) $5 \cdot 4^{n+1} = 4 \cdot 5 \cdot 4^n$

   (c) $5 \cdot 4^n(n+1) = 4 \cdot 5 \cdot 4^n \cdot n$

   (d) $20^{n+1} = 4 \cdot 20^n$

   (e) None of the above

2. We want to test the solution $a_n = 6n + C$ in the difference equation $a_{n+1} = a_n + 6$. What equation results from substituting the solution into the difference equation?

   (a) $6n + 1 + C = 6n + C + 6$

   (b) $6(n+1) + C = 6n + C + 6$

   (c) $6(n+1) + C(n+1) = 6n + Cn + 6$

   (d) $a_n + 6 = 6(a_n + 6) + C$

   (e) None of the above

3. After substituting a proposed solution into the difference equation, we arrive at

   $$2^{n+1} \cdot 8 - 5 = 2(2^n \cdot 8 - 5) + 5.$$

   Do we have a solution to the difference equation?

   (a) Yes

   (b) No

4. After substituting a proposed solution into the difference equation, we arrive at

   $$3^{n+1} \cdot 4 - 7 = 2(3^n \cdot 4 - 7) + 7.$$

   Do we have a solution to the difference equation?

   (a) Yes

(b) No

5. After substituting a proposed solution into the difference equation, we arrive at

$$6(\sqrt{5})^{n+2} = 5 \cdot 6(\sqrt{5})^{n}.$$

Do we have a solution to the difference equation?

(a) Yes
(b) No

6. **True or False** $b_n = 2^n \times 5$ is a solution to $b_{n+1} = 2b_n$ with $b_0 = 5$.

(a) True, and I am very confident
(b) True, but I am not very confident
(c) False, but I am not very confident
(d) False, and I am very confident

7. **True or False** $a_n = 3^n \cdot 2$ is a solution to $a_{n+1} = 4a_n$ with $a_0 = 2$.

(a) True, and I am very confident
(b) True, but I am not very confident
(c) False, but I am not very confident
(d) False, and I am very confident

8. **True or False** $a_n = 3^n C$ is a solution to $a_{n+1} = 3a_n$.

(a) True, and I am very confident
(b) True, but I am not very confident
(c) False, but I am not very confident
(d) False, and I am very confident

9. **True or False** $a_n = 2n$ is a solution to $a_{n+1} = a_n - 5$ with $a_0 = 0$.

(a) True, and I am very confident
(b) True, but I am not very confident
(c) False, but I am not very confident

(d) False, and I am very confident

10. **True or False** $a_n = 6n + 3$ is a solution to $a_{n+1} = a_n + 6$ with $a_0 = 3$.

    (a) True, and I am very confident
    (b) True, but I am not very confident
    (c) False, but I am not very confident
    (d) False, and I am very confident

11. **True or False** $a_n = 3^n C + 2$ is a solution to $a_{n+1} = 3a_n - 4$.

    (a) True, and I am very confident
    (b) True, but I am not very confident
    (c) False, but I am not very confident
    (d) False, and I am very confident

12. **True or False** $a_n = 3^n \cdot 5 + 2$ is a solution to $a_{n+1} = 3a_n - 4$ with $a_0 = 2$.

    (a) True, and I am very confident
    (b) True, but I am not very confident
    (c) False, but I am not very confident
    (d) False, and I am very confident

13. **True or False** $a_n = 3^n \times 4 + 5$ is a solution to $a_{n+1} = 3a_n + 5$ with $a_0 = 9$.

    (a) True, and I am very confident
    (b) True, but I am not very confident
    (c) False, but I am not very confident
    (d) False, and I am very confident

14. A numerical solution to a difference equation is

    (a) another difference equation.
    (b) a number.
    (c) a sequence.
    (d) a function that describes a sequence.

(e) None of the above

15. An analytic solution to a difference equation is

(a) another difference equation.
(b) a number.
(c) a sequence.
(d) a function that describes a sequence.
(e) None of the above