MATH 3012 Applied Combinatorics: Recurrence Relations

1. What is the primary difference between a recurrence relation and a difference equation?

A. A recurrence relation is an equation that defines a function in terms of itself, while a difference equation is an equation that defines a function in terms of its derivatives.
B. A recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a difference equation is an equation that defines a function in terms of its values at future points in time.
C. A recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a difference equation is an equation that defines a function in terms of its values at present and past points in time.
D. A recurrence relation is an equation that defines a function in terms of its values at present and past points in time, while a difference equation is an equation that defines a function in terms of its values at future points in time.

2. Which of the following is an example of a recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

3. How can a recurrence relation be used to define a function?

A. By using the recurrence relation to calculate the function's values at specific points in time.
B. By using the recurrence relation to calculate the function's values at specific points in space.
C. By using the recurrence relation to calculate the function's values at specific points in space and time.
D. By using the recurrence relation to calculate the function's values at specific points in space and time, and then using those values to graph the function.

4. What is the primary difference between a linear recurrence relation and a nonlinear recurrence relation?

A. A linear recurrence relation is an equation that defines a function in terms of itself, while a nonlinear recurrence relation is an equation that defines a function in terms of its derivatives.
B. A linear recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a nonlinear recurrence relation is an equation that defines a function in terms of its values at future points in time.
C. A linear recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a nonlinear recurrence relation is an equation that defines a function in terms of its values at present and past points in time.
D. A linear recurrence relation is an equation that defines a function in terms of its values at present and past points in time, while a nonlinear recurrence relation is an equation that defines a function in terms of its values at future points in time.

5. Which of the following is an example of a linear recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

6. Which of the following is an example of a nonlinear recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

7. What is the primary difference between a homogeneous recurrence relation and a nonhomogeneous recurrence relation?

A. A homogeneous recurrence relation is an equation that defines a function in terms of itself, while a nonhomogeneous recurrence relation is an equation that defines a function in terms of its derivatives.
B. A homogeneous recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a nonhomogeneous recurrence relation is an equation that defines a function in terms of its values at future points in time.
C. A homogeneous recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a nonhomogeneous recurrence relation is an equation that defines a function in terms of its values at present and past points in time.
D. A homogeneous recurrence relation is an equation that defines a function in terms of its values at present and past points in time, while a nonhomogeneous recurrence relation is an equation that defines a function in terms of its values at future points in time.

8. Which of the following is an example of a homogeneous recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

9. Which of the following is an example of a nonhomogeneous recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

10. What is the primary difference between a first-order recurrence relation and a second-order recurrence relation?

A. A first-order recurrence relation is an equation that defines a function in terms of itself, while a second-order recurrence relation is an equation that defines a function in terms of its derivatives.
B. A first-order recurrence relation is an equation that defines a function in terms of its values at previous points in time, while a second-order recurrence relation is an equation that defines a function in terms of its values at future points in time.
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D. A first-order recurrence relation is an equation that defines a function in terms of its values at present and past points in time, while a second-order recurrence relation is an equation that defines a function in terms of its values at future points in time.

11. Which of the following is an example of a first-order recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

12. Which of the following is an example of a second-order recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

13. What is the primary difference between an initial value problem and a boundary value problem?

A. An initial value problem is an equation that defines a function in terms of itself, while a boundary value problem is an equation that defines a function in terms of its derivatives.
B. An initial value problem is an equation that defines a function in terms of its values at previous points in time, while a boundary value problem is an equation that defines a function in terms of its values at future points in time.
C. An initial value problem is an equation that defines a function in terms of its values at previous points in time, while a boundary value problem is an equation that defines a function in terms of its values at present and past points in time.
D. An initial value problem is an equation that defines a function in terms of its values at present and past points in time, while a boundary value problem is an equation that defines a function in terms of its values at future points in time.

14. Which of the following is an example of an initial value problem?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

15. Which of the following is an example of a boundary value problem?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

16. What is the primary difference between a linear recurrence relation and a nonlinear recurrence relation?

A. A linear recurrence relation is an equation that defines a function in terms of itself, while a nonlinear recurrence relation is an equation that defines a function in terms of its derivatives.
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D. A linear recurrence relation is an equation that defines a function in terms of

its values at present and past points in time, while a nonlinear recurrence relation is an equation that defines a function in terms of its values at future points in time.

17. Which of the following is an example of a linear recurrence relation?

A. y = x^2 + 1
B. y = 2x
C. y' = x^2 + 1
D. y' = 2x

18. Which of the following is an example of a nonlinear recurrence relation?

A. y = x^2 + 1
B. y = 2x
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19. What is the primary difference between a homogeneous recurrence relation and a nonhomogeneous recurrence relation?

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B. y = 2x
C. y' = x^2 + 1
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23. Which of the following is an example of a first-order recurrence relation?

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26. Which of the following is an example of an initial value problem?

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C. y' = x^2 + 1
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