

*Test Bank for Precalculus for AP
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Panman*

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Chapter 01 - Functions

1. Which description best defines a function?
- a. A relation where each input has exactly one output
 - b. A relation where each output has exactly one input
 - c. A relation where each input has multiple outputs
 - d. A set of unrelated numbers

ANSWER: a

RATIONALE: A function assigns exactly one output to each input.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.1.1 - Identify a function's input and output values and any restrictions on them.

KEYWORDS: Understand

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2. Let $f(x) = 2x + 3$. Evaluate $f(2)$.

ANSWER: 7

RATIONALE: Substitute $x = 2$: $f(2) = 2(2) + 3 = 7$.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.

KEYWORDS: Analyze | Apply

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3. A graph passes the vertical line test. What does this indicate?
- a. It is linear
 - b. It is a function
 - c. It is constant
 - d. It is not a function

ANSWER: b

RATIONALE: Passing the vertical line test means each input corresponds to exactly one output.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.2

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

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LEARNING OBJECTIVES: PFAP.1.2.2 - Determine whether a relation represents a function based on a graph, equation, or table of values.

KEYWORDS: Analyze | Apply

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4. A student tracks pages read each day and sees the total number of pages increase daily. What is the sign of the rate of change?

- a. Negative
- b. Zero
- c. Positive
- d. Undefined

ANSWER: c

RATIONALE: Increasing output over time indicates a positive rate of change.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.

KEYWORDS: Analyze | Apply

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5. Find the slope of the line passing through (2, 3) and (6, 11).

ANSWER: 2

RATIONALE:
$$m = \frac{11 - 3}{6 - 2} = \frac{8}{4} = 2.$$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.

KEYWORDS: Analyze | Apply

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6. Let $f(x) = x^2 - 3x$. Evaluate $f(-1)$

ANSWER: 4

RATIONALE:
$$f(-1) = (-1)^2 - 3(-1) = 1 + 3 = 4$$

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POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.
KEYWORDS: Analyze | Apply
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7. Evaluate $f(3)$ if $f(x) = 2x - 7$.

- a. -1
- b. -2
- c. -3
- d. -4

ANSWER: a
RATIONALE: $f(3) = 2(3) - 7 = 6 - 7 = -1$

POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.
KEYWORDS: Analyze | Apply
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8. Which set of ordered pairs represents a function?

- a. $\{(1,2), (1,3)\}$
- b. $\{(1,2), (2,3), (3,4)\}$
- c. $\{(1,2), (2,2), (2,3)\}$
- d. $\{(1,2), (1,2), (2,3)\}$

ANSWER: b
RATIONALE: Each input must correspond to exactly one output.

POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.2
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.2.2 - Determine whether a relation represents a function based on a graph, equation, or table of values.
KEYWORDS: Analyze | Apply

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9. A graph fails the vertical line test. What does this imply?

- a. It is a function
- b. It is not a function
- c. It is constant
- d. It is linear

ANSWER: b

RATIONALE: Failing the vertical line test means one input has multiple outputs.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.2

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.2.2 - Determine whether a relation represents a function based on a graph, equation, or table of values.

KEYWORDS: Analyze | Apply

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10. The temperature in a room drops from 75°F to 68°F over time. What is the sign of the rate of change?

ANSWER: Negative

RATIONALE: A decrease in output corresponds to a negative rate of change.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.

KEYWORDS: Analyze | Apply

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11. What is the slope of a horizontal line?

- a. 0
- b. Undefined
- c. 1
- d. -1

ANSWER: a

RATIONALE: A horizontal line has no change in y, so slope is 0.

POINTS: 1

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DIFFICULTY: Easy
REFERENCES: Section 1.4
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.
KEYWORDS: Understand
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12. What is the slope of a vertical line?

ANSWER: Undefined
RATIONALE: The slope is undefined because division by zero occurs.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.4
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.
KEYWORDS: Understand
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13. What does a constant rate of change indicate?

- a. Quadratic function
- b. Linear function
- c. Exponential function
- d. Random behavior

ANSWER: b
RATIONALE: Linear functions have constant rates of change.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.6
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.
KEYWORDS: Understand
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14. Write the equation of a line with slope 3 and y-intercept -2.

ANSWER: $y = 3x - 2$
RATIONALE: Use slope-intercept form $y = mx + b$.

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POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.4
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.4.2 - Write a linear equation in point-slope form and slope-intercept form.
KEYWORDS: Analyze | Apply
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15. What is the domain of $f(x) = \frac{1}{x-4}$?

- a. All real numbers
- b. All real numbers except 4
- c. All real numbers except 0
- d. $x > 4$ only

ANSWER: b
RATIONALE: The denominator cannot equal zero, so $x \neq 4$.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.1.1 - Identify a function's input and output values and any restrictions on them.
KEYWORDS: Understand
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16. What is the range of $f(x) = 2x + 5$?

ANSWER: All real numbers
RATIONALE: A non-constant linear function takes all real values.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.3
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.3.1 - Identify key features of a graph, including
KEYWORDS: Understand
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17. A car's distance from a starting point increases steadily over time. What is the sign of the rate of change?

- a. Negative
- b. Zero
- c. Positive
- d. Undefined

ANSWER: c

RATIONALE: Increasing distance implies a positive rate of change.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.

KEYWORDS: Analyze | Apply

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18. A tank is being drained, and the water level decreases over time. What is the sign of the rate of change?

ANSWER: Negative

RATIONALE: Decreasing output corresponds to a negative rate of change.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.

KEYWORDS: Analyze | Apply

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19. A company's profit remains constant over time. What is the rate of change?

- a. Positive
- b. Negative
- c. Zero
- d. Undefined

ANSWER: c

RATIONALE: No change in output implies a zero rate of change.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Multiple Choice

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HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.

KEYWORDS: Analyze | Apply

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20. Find the midpoint between (2, 4) and (6, 8).

ANSWER: (4, 6)

RATIONALE: $\left(\frac{2+6}{2}, \frac{4+8}{2} \right) = (4, 6)$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.

KEYWORDS: Analyze | Apply

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21. Find the slope between the points (1, 2) and (3, 6).

- a. 1
- b. 2
- c. 3
- d. 4

ANSWER: b

RATIONALE: $m = \frac{6-2}{3-1} = \frac{4}{2} = 2$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.

KEYWORDS: Analyze | Apply

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22. A company charges a fixed fee plus a constant cost per item sold. Which type of model best represents this situation?

- a. Quadratic
- b. Linear

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- c. Exponential
- d. Constant

ANSWER: b
RATIONALE: A fixed fee plus constant rate indicates a linear model.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.6
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.6.1 - Construct a linear model for a contextual scenario.
KEYWORDS: Analyze | Apply
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23. The sequence 2, 5, 10, 17 follows a pattern. Which model best represents this data?

- a. Linear
- b. Quadratic
- c. Exponential
- d. Constant

ANSWER: b
RATIONALE: First differences: 3, 5, 7 → constant second differences.
POINTS: 1
DIFFICULTY: Medium
REFERENCES: Section 1.8
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.8.2 - Calculate a second-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is quadratic.
KEYWORDS: Analyze | Apply
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24. A data set shows outputs increasing by the same amount for equal increases in input. What type of model describes this?

ANSWER: Linear
RATIONALE: Constant first differences indicate a linear pattern.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.8
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.8.1 - Calculate a first-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is linear.

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KEYWORDS: Analyze | Apply
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25. Let $f(x) = x^2$. Find the average rate of change from $x=1$ to $x=3$.

- a. 2
- b. 3
- c. 4
- d. 5

ANSWER: c
RATIONALE: $\frac{9-1}{3-1} = \frac{8}{2} = 4$

POINTS: 1
DIFFICULTY: Medium
REFERENCES: Section 1.5
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.5.1 - Calculate the average rate of change of a function given an interval of input values.
KEYWORDS: Analyze | Apply
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26. A graph rises from left to right across its domain. What does this indicate?

- a. Decreasing
- b. Constant
- c. Increasing
- d. Undefined

ANSWER: c
RATIONALE: Rising left to right indicates increasing behavior.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.3
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.3.1 - Identify key features of a graph, including
KEYWORDS: Analyze | Apply
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27. Write the equation of a line with slope 2 that passes through (0, 5).

ANSWER: $y = 2x + 5$
RATIONALE: Use slope-intercept form.
POINTS: 1

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DIFFICULTY: Easy
REFERENCES: Section 1.4
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.4.2 - Write a linear equation in point-slope form and slope-intercept form.
KEYWORDS: Analyze | Apply
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28. A business notices revenue decreases as price increases. What is the sign of the rate of change?

- a. Positive
- b. Negative
- c. Zero
- d. Undefined

ANSWER: b
RATIONALE: Decreasing output implies negative rate of change.
POINTS: 1
DIFFICULTY: Medium
REFERENCES: Section 1.5
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.
KEYWORDS: Analyze | Apply
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29. Determine the domain of $f(x) = \frac{1}{x^2 - 9}$

ANSWER: All real numbers except $x = 3$ and $x = -3$
RATIONALE: Denominator cannot be zero.
POINTS: 1
DIFFICULTY: Medium
REFERENCES: Section 1.1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.1.1 - Identify a function's input and output values and any restrictions on them.
KEYWORDS: Analyze | Apply
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30. Find the midpoint between (4, 2) and (10, 6).

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- a. (6,4)
- b. (7,4)
- c. (7,5)
- d. (8,4)

ANSWER:

b

RATIONALE:

Midpoint formula: $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{4+10}{2}, \frac{2+6}{2}\right) = (7,4)$

POINTS:

1

DIFFICULTY:

Easy

REFERENCES:

Section 1.4

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.

KEYWORDS:

Analyze | Apply

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31. Let $f(x) = 3x - 5$. Evaluate $f(4)$.

- a. 5
- b. 7
- c. 9
- d. 11

ANSWER:

b

RATIONALE:

Substitute $x = 4$: $f(4) = 3(4) - 5 = 12 - 5 = 7$.

POINTS:

1

DIFFICULTY:

Easy

REFERENCES:

Section 1.1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.

KEYWORDS:

Analyze | Apply

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32. Let $f(x) = x^2 + 2x$. Evaluate $f(-2)$.

ANSWER:

0

RATIONALE:

$f(-2) = (-2)^2 + 2(-2) = 4 - 4 = 0$.

POINTS:

1

DIFFICULTY:

Easy

REFERENCES:

Section 1.1

QUESTION TYPE:

Subjective Short Answer

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HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.

KEYWORDS: Analyze | Apply

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33. A graph shows a horizontal line across all x-values. What does this indicate about the function?

- a. Increasing
- b. Decreasing
- c. Constant
- d. Not a function

ANSWER: c

RATIONALE: A horizontal line represents a constant function with no change in output.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.3

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.3.1 - Identify key features of a graph, including

KEYWORDS: Analyze | Apply

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34. Find the slope of the line passing through (0, 1) and (4, 9).

ANSWER: 2

RATIONALE:
$$m = \frac{9 - 1}{4 - 0} = \frac{8}{4} = 2$$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.

KEYWORDS: Analyze | Apply

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35. A function increases as x increases. What is the sign of the rate of change?

- a. Negative
- b. Positive
- c. Zero
- d. Undefined

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ANSWER: b
RATIONALE: Increasing functions have positive rates of change.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.5
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.
KEYWORDS: Analyze | Apply
DATE CREATED: 5/15/2026 5:22 AM
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36. Let $f(x) = 2x + 1$. Find the average rate of change from $x = 0$ to $x = 5$.

ANSWER: 2
RATIONALE:
$$\frac{f(5) - f(0)}{5 - 0} = \frac{11 - 1}{5} = 2$$

POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.5
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.5.1 - Calculate the average rate of change of a function given an interval of input values.
KEYWORDS: Analyze | Apply
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37. A data set shows a constant rate of change between successive values. Which model best represents the data?

- a. Linear
- b. Quadratic
- c. Exponential
- d. Cubic

ANSWER: a
RATIONALE: Constant rate of change indicates a linear model.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.8
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.8.1 - Calculate a first-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is linear.
KEYWORDS: Analyze | Apply

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38. Write the equation of a line with slope -1 and y-intercept 3.

ANSWER: $y = -x + 3$

RATIONALE: Use slope-intercept form $y = mx + b$.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.4.2 - Write a linear equation in point-slope form and slope-intercept form.

KEYWORDS: Analyze | Apply

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39. What is the domain of $f(x) = \frac{1}{x+2}$?

- a. All real numbers
- b. All real numbers except -2
- c. All real numbers except 2
- d. $x > -2$ only

ANSWER: b

RATIONALE: The denominator cannot be zero, so $x \neq -2$.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.1.1 - Identify a function's input and output values and any restrictions on them.

KEYWORDS: Analyze | Apply

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40. Find the midpoint between (0, -2) and (8, 6).

ANSWER: (4, 2)

RATIONALE: $\left(\frac{0+8}{2}, \frac{-2+6}{2} \right) = (4, 2)$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

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QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.
KEYWORDS: Analyze | Apply
DATE CREATED: 5/15/2026 5:22 AM
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41. Let $f(x) = 4x - 1$. Evaluate $f(3)$.

- a. 9
- b. 10
- c. 11
- d. 12

ANSWER: c
RATIONALE: $f(3) = 12 - 1 = 11$
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.
KEYWORDS: Analyze | Apply
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42. Let $f(x) = x^2 - 4$. Evaluate $f(2)$.

ANSWER: 0
RATIONALE: $f(2) = 4 - 4 = 0$
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.1
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.1.2 - Evaluate a function at a given input value.
KEYWORDS: Analyze | Apply
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43. A graph shows a line decreasing from left to right. What does this indicate?

- a. Increasing
- b. Decreasing
- c. Constant

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d. Undefined

ANSWER: b
RATIONALE: A decreasing graph falls from left to right.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.3
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.3.1 - Identify key features of a graph, including
KEYWORDS: Analyze | Apply
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44. Find the slope of the line passing through (2, 5) and (6, 13).

ANSWER: 2
RATIONALE: $(13 - 5) / (6 - 2) = 8 / 4 = 2$
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.4
QUESTION TYPE: Subjective Short Answer
HAS VARIABLES: False
STUDENT ENTRY MODE: Basic
LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.
KEYWORDS: Analyze | Apply
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45. A function has a rate of change equal to zero. What does this indicate?

- a. Increasing
- b. Decreasing
- c. Constant
- d. Undefined

ANSWER: c
RATIONALE: Zero rate of change means no change in output.
POINTS: 1
DIFFICULTY: Easy
REFERENCES: Section 1.5
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.
KEYWORDS: Analyze | Apply
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46. Let $f(x) = x + 6$. Find the average rate of change from $x = 2$ to $x = 8$.

ANSWER: 1

RATIONALE: $(14 - 8) / 6 = 1$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.5.1 - Calculate the average rate of change of a function given an interval of input values.

KEYWORDS: Analyze | Apply

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47. A data set shows increasing first differences. Which model best fits?

- a. Linear
- b. Quadratic
- c. Exponential
- d. Constant

ANSWER: b

RATIONALE: Increasing first differences imply quadratic behavior.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.8

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.8.2 - Calculate a second-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is quadratic.

KEYWORDS: Analyze | Apply

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48. Write the equation of a line with slope 5 and y-intercept -4.

ANSWER: $y = 5x - 4$

RATIONALE: Use $y = mx + b$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

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LEARNING OBJECTIVES: PFAP.1.4.2 - Write a linear equation in point-slope form and slope-intercept form.

KEYWORDS: Analyze | Apply

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49. What is the domain of $f(x) = \frac{1}{x^2 - 1}$?

- a. All real numbers
- b. All real numbers except 1
- c. All real numbers except -1
- d. All real numbers except -1 and 1

ANSWER: d

RATIONALE: Denominator cannot be zero.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.1.1 - Identify a function's input and output values and any restrictions on them.

KEYWORDS: Analyze | Apply

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50. Find the midpoint between (-2, 4) and (6, 0).

ANSWER: (2, 2)

RATIONALE: Midpoint formula.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.4

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.4.1 - Find the slope of a line.

KEYWORDS: Analyze | Apply

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51. A data set shows the following values:

x: 1, 2, 3, 4

y: 3, 6, 11, 18

Which model best fits the data?

- a. Linear
- b. Quadratic

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- c. Exponential
- d. Constant

ANSWER: b

RATIONALE: First differences are 3, 5, 7, which increase by a constant amount, so second differences are constant, indicating a quadratic model.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.8

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.8.2 - Calculate a second-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is quadratic.

KEYWORDS: Evaluate

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52. Calculate the average rate of change of $f(x) = x^2$ on the interval $[1,3]$.

ANSWER: 4

RATIONALE:
$$\frac{f(3)-f(1)}{3-1} = \frac{9-1}{2} = \frac{8}{2} = 4$$

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.5

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.5.1 - Calculate the average rate of change of a function given an interval of input values.

KEYWORDS: Analyze | Apply

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53. A student claims that the function $f(x) = 2x + 5$ is decreasing because the y-intercept is positive. Is the student correct? Explain.

ANSWER: No; the function is increasing because the slope is positive.

RATIONALE: The sign of the slope determines whether a function increases or decreases, not the y-intercept.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.6

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

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LEARNING OBJECTIVES: PFAP.1.4.2 - Write a linear equation in point-slope form and slope-intercept form.

KEYWORDS: Evaluate

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54. Two functions are described:

Function A has a constant rate of change.

Function B has a changing rate of change.

Which function is best modeled by a quadratic function?

- a. Function A
- b. Function B
- c. Both
- d. Neither

ANSWER: b

RATIONALE: Quadratic functions have changing rates of change, while linear functions have constant rates of change.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.5

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.5.3 - Determine whether a function is increasing or decreasing based on its average rate of change on an interval of input values.

KEYWORDS: Evaluate

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55. A graph passes the vertical line test but has repeated y-values. A student concludes it is not a function. Is this correct? Explain.

ANSWER: No; a function can have repeated outputs as long as each input has only one output.

RATIONALE: The vertical line test checks for multiple outputs per input, not repeated outputs overall.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.2

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.2.2 - Determine whether a relation represents a function based on a graph, equation, or table of values.

KEYWORDS: Evaluate

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56. A data set shows constant first differences. A student models the data using a quadratic function. What is the best

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critique?

- a. The student is correct
- b. The student should use a linear model
- c. The student should use an exponential model
- d. There is not enough information

ANSWER: b

RATIONALE: Constant first differences indicate a linear pattern, not quadratic.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.8

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.8.1 - Calculate a first-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is linear.

KEYWORDS: Evaluate

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57. Two models are proposed for a data set:

Model A: Linear

Model B: Quadratic

The data shows increasing first differences. Which model is more appropriate? Explain.

ANSWER: Quadratic; increasing first differences indicate a changing rate of change.

RATIONALE: Linear models require constant first differences, while quadratic models show changing first differences.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.8

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.8.2 - Calculate a second-difference sequence for a function over equal-length input value intervals, and use it to determine whether the function is quadratic.

KEYWORDS: Evaluate

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58. A function has an average rate of change of 0 over an interval. Which conclusion is best?

- a. The function is increasing
- b. The function is decreasing
- c. The function has equal values at the endpoints

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d. The function is constant over the interval

ANSWER: c

RATIONALE: A zero average rate of change means the outputs at the endpoints are equal, not necessarily constant throughout the interval.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.5

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.5.1 - Calculate the average rate of change of a function given an interval of input values.

KEYWORDS: Evaluate

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59. A student states that all linear functions have a range of all real numbers. Is this always true? Explain.

ANSWER: No; a constant linear function has a single output value, so its range is not all real numbers.

RATIONALE: Only non-constant linear functions have range equal to all real numbers.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.6

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.6.1 - Construct a linear model for a contextual scenario.

KEYWORDS: Evaluate

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60. Which statement best explains why a vertical line is not a function?

- a. It has no slope
- b. It has more than one y-value for a single x-value
- c. It is undefined
- d. It is constant

ANSWER: b

RATIONALE: A vertical line assigns multiple outputs to a single input, violating the definition of a function.

POINTS: 1

DIFFICULTY: Easy

REFERENCES: Section 1.2

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

LEARNING OBJECTIVES: PFAP.1.2.2 - Determine whether a relation represents a function based on a graph, equation, or table of values.

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KEYWORDS: Evaluate
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61. A data set is modeled using a linear function, but the rate of change is not constant. What is the best conclusion?

ANSWER: The linear model is not appropriate because the rate of change is not constant.

RATIONALE: Linear models require a constant rate of change, so a changing rate indicates a different model is needed.

POINTS: 1

DIFFICULTY: Medium

REFERENCES: Section 1.6

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

STUDENT ENTRY MODE: Basic

LEARNING OBJECTIVES: PFAP.1.9.3 - Justify whether a linear regression model is appropriate based on its residual plot.

KEYWORDS: Evaluate
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