INTALG: Functions and Graphs

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Learning Objectives

- Evaluate a function using function notation f(x)
- Determine the domain and range of a function
- Compute slope and write the equation of a line
- Find the composition and inverse of a function

Simplify each expression completely. Show all steps and circle your final answer.

Function composition

1. Let f(x) = 1x + -5 and g(x) = 3x + -2. Find (f o g)(-1) = f(g(-1)).

$$f(x) = 1x + -5,\ g(x) = 3x + -2,\ x = -1$$

Answer: _____

2. Let f(x) = 3x + 1 and g(x) = 4x + -1. Find (f o g)(-2) = f(g(-2)).

$$f(x) = 3x + 1,\ g(x) = 4x + -1,\ x = -2$$

Answer: _____

3. Let f(x) = 5x + 0 and g(x) = 2x + 3. Find (f o g)(3) = f(g(3)).

$$f(x) = 5x + 0,\ g(x) = 2x + 3,\ x = 3$$

Answer: _____

4. Let f(x) = 2x + 3 and g(x) = 5x + -3. Find (f o g)(-1) = f(g(-1)).

$$f(x) = 2x + 3,\ g(x) = 5x + -3,\ x = -1$$

Answer: _____

5. Let f(x) = 2x + 2 and g(x) = 5x + -1. Find (f o g)(1) = f(g(1)).

$$f(x) = 2x + 2,\ g(x) = 5x + -1,\ x = 1$$

Answer: _____

6. Let f(x) = 1x + 0 and g(x) = 5x + 4. Find (f o g)(-2) = f(g(-2)).

$$f(x) = 1x + 0,\ g(x) = 5x + 4,\ x = -2$$

Answer: _____

7. Let f(x) = 3x + -1 and g(x) = 5x + -3. Find (f o g)(0) = f(g(0)).

$$f(x) = 3x + -1,\ g(x) = 5x + -3,\ x = 0$$

Answer: _____

8. Let f(x) = 4x + 2 and g(x) = 3x + -1. Find (f o g)(1) = f(g(1)).

$$f(x) = 4x + 2,\ g(x) = 3x + -1,\ x = 1$$

Answer: _____

9. Let f(x) = 1x + -1 and g(x) = 4x + -2. Find (f o g)(4) = f(g(4)).

$$f(x) = 1x + -1,\ g(x) = 4x + -2,\ x = 4$$

Answer: _____

10. Let f(x) = 1x + -4 and g(x) = 2x + -4. Find (f o g)(2) = f(g(2)).

$$f(x) = 1x + -4,\ g(x) = 2x + -4,\ x = 2$$

Answer: _____

Evaluating functions

11. Let f(x) = 1x + 1. Find f(-2).

$$f(x) = 1x + 1, \quad x = -2$$

Answer: _____

12. Let f(x) = 1x + 4. Find f(-4).

$$f(x) = 1x + 4, \quad x = -4$$

Answer: _____

13. Let f(x) = 1x + 3. Find f(2).

$$f(x) = 1x + 3, \quad x = 2$$

Answer: _____

14. Let f(x) = 3x + -7. Find f(4).

$$f(x) = 3x - 7, \quad x = 4$$

Answer: _____

15. Let f(x) = 1x + -2. Find f(-2).

$$f(x) = 1x - 2, \quad x = -2$$

Answer: _____

16. Let f(x) = 5x + -2. Find f(-1).

$$f(x) = 5x - 2, \quad x = -1$$

Answer: _____

17. Let f(x) = 4x + -3. Find f(4).

$$f(x) = 4x - 3, \quad x = 4$$

Answer: _____

18. Let f(x) = 4x + -5. Find f(6).

$$f(x) = 4x - 5, \quad x = 6$$

Answer: _____

19. Let f(x) = 1x + -5. Find f(2).

$$f(x) = 1x - 5, \quad x = 2$$

Answer: _____

20. Let f(x) = 1x + 1. Find f(3).

$$f(x) = 1x + 1, \quad x = 3$$

Answer: _____

Slope and linear equations

21. Find the slope of the line through (1, 3) and (6, 7).

$$(1, 3),\ (6, 7)$$

Answer: _____

22. Find the slope of the line through (0, -4) and (4, -3).

$$(0, -4),\ (4, -3)$$

Answer: _____

23. Find the slope of the line through (2, -1) and (5, 2).

$$(2, -1),\ (5, 2)$$

Answer: _____

24. Find the slope of the line through (-2, 2) and (3, 6).

$(-2, 2),\ (3, 6)$

Answer: _____

25. Find the slope of the line through (-5, 2) and (1, 3).

$(-5, 2),\ (1, 3)$

Answer: _____

26. Find the slope of the line through (-2, -4) and (4, -4).

$(-2, -4),\ (4, -4)$

Answer: _____

27. Find the slope of the line through (-3, -4) and (4, -8).

$(-3, -4),\ (4, -8)$

Answer: _____

28. Find the slope of the line through (1, -1) and (4, 0).

$(1, -1),\ (4, 0)$

Answer: _____

29. Find the slope of the line through (2, 3) and (3, 5).

$(2, 3),\ (3, 5)$

Answer: _____

30. Find the slope of the line through (0, 3) and (5, 8).

$(0, 3),\ (5, 8)$

Answer: _____

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ANSWER KEY & SOLUTIONS

Topics: Function composition, Evaluating functions, Slope and linear equations. All answers verified by independent computation.

Solutions

Function composition

1. Let f(x) = 1x + -5 and g(x) = 3x + -2. Find (f o g)(-1) = f(g(-1)).

$$f(x) = 1x + -5,\ g(x) = 3x + -2,\ x = -1$$

→ *g(-1) = 3(-1) + -2 = -5.*
→ *f(-5) = 1(-5) + -5 = -10.*

Answer: $(f \circ g)(-1) = f(-5) = -10$

2. Let f(x) = 3x + 1 and g(x) = 4x + -1. Find (f o g)(-2) = f(g(-2)).

$$f(x) = 3x + 1,\ g(x) = 4x + -1,\ x = -2$$

→ *g(-2) = 4(-2) + -1 = -9.*
→ *f(-9) = 3(-9) + 1 = -26.*

Answer: $(f \circ g)(-2) = f(-9) = -26$

3. Let f(x) = 5x + 0 and g(x) = 2x + 3. Find (f o g)(3) = f(g(3)).

$$f(x) = 5x + 0,\ g(x) = 2x + 3,\ x = 3$$

→ *g(3) = 2(3) + 3 = 9.*
→ *f(9) = 5(9) + 0 = 45.*

Answer: $(f \circ g)(3) = f(9) = 45$

4. Let f(x) = 2x + 3 and g(x) = 5x + -3. Find (f o g)(-1) = f(g(-1)).

$$f(x) = 2x + 3,\ g(x) = 5x + -3,\ x = -1$$

→ *g(-1) = 5(-1) + -3 = -8.*
→ *f(-8) = 2(-8) + 3 = -13.*

Answer: $(f \circ g)(-1) = f(-8) = -13$

5. Let f(x) = 2x + 2 and g(x) = 5x + -1. Find (f o g)(1) = f(g(1)).

$$f(x) = 2x + 2,\ g(x) = 5x + -1,\ x = 1$$

→ *g(1) = 5(1) + -1 = 4.*
→ *f(4) = 2(4) + 2 = 10.*

Answer: $(f \circ g)(1) = f(4) = 10$

6. Let f(x) = 1x + 0 and g(x) = 5x + 4. Find (f o g)(-2) = f(g(-2)).

$$f(x) = 1x + 0,\ g(x) = 5x + 4,\ x = -2$$

→ *g(-2) = 5(-2) + 4 = -6.*
→ *f(-6) = 1(-6) + 0 = -6.*

Answer: $(f \circ g)(-2) = f(-6) = -6$

7. Let f(x) = 3x + -1 and g(x) = 5x + -3. Find (f o g)(0) = f(g(0)).

$$f(x) = 3x + -1,\ g(x) = 5x + -3,\ x = 0$$

→ *g(0) = 5(0) + -3 = -3.*
→ *f(-3) = 3(-3) + -1 = -10.*

Answer: $(f \circ g)(0) = f(-3) = -10$

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8. Let f(x) = 4x + 2 and g(x) = 3x + -1. Find (f o g)(1) = f(g(1)).

$$f(x) = 4x + 2,\ g(x) = 3x + -1,\ x = 1$$

→ *g(1) = 3(1) + -1 = 2.*
→ *f(2) = 4(2) + 2 = 10.*

Answer: $(f \circ g)(1) = f(2) = 10$

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9. Let f(x) = 1x + -1 and g(x) = 4x + -2. Find (f o g)(4) = f(g(4)).

$$f(x) = 1x + -1,\ g(x) = 4x + -2,\ x = 4$$

→ *g(4) = 4(4) + -2 = 14.*
→ *f(14) = 1(14) + -1 = 13.*

Answer: $(f \circ g)(4) = f(14) = 13$

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10. Let f(x) = 1x + -4 and g(x) = 2x + -4. Find (f o g)(2) = f(g(2)).

$$f(x) = 1x + -4,\ g(x) = 2x + -4,\ x = 2$$

→ *g(2) = 2(2) + -4 = 0.*
→ *f(0) = 1(0) + -4 = -4.*

Answer: $(f \circ g)(2) = f(0) = -4$

Evaluating functions

11. Let f(x) = 1x + 1. Find f(-2).

$$f(x) = 1x + 1, \quad x = -2$$

→ *f(-2) = 1(-2) + 1 = -2 + 1 = -1.*

Answer: $f(-2) = -1$

12. Let f(x) = 1x + 4. Find f(-4).

$$f(x) = 1x + 4, \quad x = -4$$

→ *f(-4) = 1(-4) + 4 = -4 + 4 = 0.*

Answer: $f(-4) = 0$

13. Let f(x) = 1x + 3. Find f(2).

$$f(x) = 1x + 3, \quad x = 2$$

→ *f(2) = 1(2) + 3 = 2 + 3 = 5.*

Answer: $f(2) = 5$

14. Let f(x) = 3x + -7. Find f(4).

$$f(x) = 3x - 7, \quad x = 4$$

→ *f(4) = 3(4) + -7 = 12 + -7 = 5.*

Answer: $f(4) = 5$

15. Let f(x) = 1x + -2. Find f(-2).

$$f(x) = 1x - 2, \quad x = -2$$

→ *f(-2) = 1(-2) + -2 = -2 + -2 = -4.*

Answer: $f(-2) = -4$

16. Let f(x) = 5x + -2. Find f(-1).

$$f(x) = 5x - 2, \quad x = -1$$

→ *f(-1) = 5(-1) + -2 = -5 + -2 = -7.*

Answer: $f(-1) = -7$

17. Let f(x) = 4x + -3. Find f(4).

$$f(x) = 4x - 3, \quad x = 4$$

→ *f(4) = 4(4) + -3 = 16 + -3 = 13.*

Answer: $f(4) = 13$

18. Let f(x) = 4x + -5. Find f(6).

$f(x) = 4x - 5, \quad x = 6$

→ *f(6) = 4(6) + -5 = 24 + -5 = 19.*

Answer: $f(6) = 19$

19. Let f(x) = 1x + -5. Find f(2).

$f(x) = 1x - 5, \quad x = 2$

→ *f(2) = 1(2) + -5 = 2 + -5 = -3.*

Answer: $f(2) = -3$

20. Let f(x) = 1x + 1. Find f(3).

$f(x) = 1x + 1, \quad x = 3$

→ *f(3) = 1(3) + 1 = 3 + 1 = 4.*

Answer: $f(3) = 4$

Slope and linear equations

21. Find the slope of the line through (1, 3) and (6, 7).

$(1, 3),\ (6, 7)$

→ *m = (y2-y1)/(x2-x1) = 4/5 = 4/5.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{4}{5} = 4/5$

22. Find the slope of the line through (0, -4) and (4, -3).

$(0,\ -4),\ (4,\ -3)$

→ *m = (y2-y1)/(x2-x1) = 1/4 = 1/4.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{1}{4} = 1/4$

23. Find the slope of the line through (2, -1) and (5, 2).

$(2,\ -1),\ (5, 2)$

→ *m = (y2-y1)/(x2-x1) = 3/3 = 1.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{3}{3} = 1$

24. Find the slope of the line through (-2, 2) and (3, 6).

$(-2, 2),\ (3, 6)$

→ *m = (y2-y1)/(x2-x1) = 4/5 = 4/5.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{4}{5} = 4/5$

25. Find the slope of the line through (-5, 2) and (1, 3).

$(-5, 2),\ (1, 3)$

→ *m = (y2-y1)/(x2-x1) = 1/6 = 1/6.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{1}{6} = 1/6$

26. Find the slope of the line through (-2, -4) and (4, -4).

$(-2,\ -4),\ (4,\ -4)$

→ *m = (y2-y1)/(x2-x1) = 0/6 = 0.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{0}{6} = 0$

27. Find the slope of the line through (-3, -4) and (4, -8).

$(-3, -4), (4, -8)$

→ *m = (y2-y1)/(x2-x1) = -4/7 = -4/7.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{-4}{7} = -4/7$

28. Find the slope of the line through (1, -1) and (4, 0).

$(1, -1), (4, 0)$

→ *m = (y2-y1)/(x2-x1) = 1/3 = 1/3.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{1}{3} = 1/3$

29. Find the slope of the line through (2, 3) and (3, 5).

$(2, 3), (3, 5)$

→ *m = (y2-y1)/(x2-x1) = 2/1 = 2.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{2}{1} = 2$

30. Find the slope of the line through (0, 3) and (5, 8).

$(0, 3), (5, 8)$

→ *m = (y2-y1)/(x2-x1) = 5/5 = 1.*

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{5}{5} = 1$