

Name: _____

Combinations and Composition of Functions

Exercise 1: Given that $f(x) = x^2 - 2x + 3$ and $g(x) = 3x^2 + 5x - 7$, find:

$$(f + g)_{(x)} - (f - g)_{(x)} - (f \bullet g)_{(x)}$$

Exercise 2: Find $f \circ g$ and $g \circ f$ in each of the following cases:

- 1) $f(x) = x + 1$ and $g(x) = 3x - 2$
- 2) $f(x) = \sqrt{2x + 1}$ and $g(x) = x^2 - 2$
- 3) $f(x) = \frac{x}{x + 5}$ and $g(x) = \frac{x}{x + 9}$
- 4) $f(x) = 3x + 9$ and $g(x) = \frac{x + 3}{x + 5}$
- 5) $f(x) = 3x - 5$ and $g(x) = 3x - 11$
- 6) $f(x) = \sqrt{2x + 4}$ and $g(x) = \sqrt{6x - 2}$

Exercise 3: Write each function as a composition of two functions.

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| 1) $f(x) = (3x - 11)^2$ | 2) $f(x) = (3x + 7)^2$ |
| 3) $f(x) = (5x + 9)^2 + 7(5x + 9)$ | 4) $f(x) = (4x - 1)^2 + 7(4x - 1)$ |
| 5) $f(x) = \frac{1}{(3x + 10)^2}$ | 6) $h(x) = \frac{1}{(4x + 9)^2}$ |
| 7) $f(x) = \sqrt{x}$ | 8) $f(x) = \sqrt{4x - 9}$ |

Exercise 4: Suppose that $f(x) = 7x + 1$ and $g(x) = x^3 + 11x - 9$. Find:

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|----------------------------------|----------------------------------|
| 1) $(f \circ f)_{(x)}$ | 2) $[f \circ (f \circ g)]_{(x)}$ |
| 3) $[g \circ (g \circ g)]_{(x)}$ | 4) $[f \circ (g \circ f)]_{(x)}$ |