ILLAWARRA TUTORING

In this worksheet you will practise forming and evaluating composite functions. You will learn to substitute one function into another and simplify the resulting expressions. Remember that a composite function $(f \circ g)(x)$ means that you evaluate $g(x)$ first and then apply f to the result.

Easy Questions

1. Evaluate $(f \circ g)(3)$ if $f(x) = x + 2$ and $g(x) = 3x$.
2. Find $g\big(f(2)\big)$ given $f(x) = 2x - 1$ and $g(x) = x^2$.
3. Write the expression for $f\big(g(x)\big)$ where $f(x) = x - 4$ and $g(x) = x + 4$.
4. Determine $(g \circ f)(1)$ for $f(x) = x^2$ and $g(x) = 2x + 1$.
5. If $f(x) = 5$ for all x and $g(x) = x + 3$, compute $(g \circ f)(x)$.

Intermediate Questions

6. Given $f(x) = 2x + 3$ and $g(x) = x^2$, find and simplify $f\big(g(x)\big)$.
7. For $f(x) = x^2 - 1$ and $g(x) = 3x + 2$, determine $g\big(f(x)\big)$ and simplify your answer.
8. If $f(x) = \dfrac{x}{2}$ and $g(x) = 4x - 5$, find the composite function $(f \circ g)(x)$.
9. Let $f(x) = x - 3$ and $g(x) = x^2 + 1$. Write an expression for $(g \circ f)(x)$.
10. Given $f(x) = x + 7$ and $g(x) = 2x$, find the value of x such that $(f \circ g)(x) = 21$.
11. If $f(x) = 3x$ and $g(x) = x - 2$, compute $(g \circ f)(x)$.
12. For $f(x) = x^2$ and $g(x) = x + 4$, write $(g \circ f)(x)$ and state its domain.
13. Let $f(x) = \dfrac{1}{x + 1}$ and $g(x) = 2x$. Compute $f\big(g(x)\big)$.
14. Given $f(x) = 3x - 4$ and $g(x) = x^2 + 1$, find $(g \circ f)(-1)$.
15. If $f(x) = x^2$ and $g(x) = 3x$, calculate both $f\big(g(x)\big)$ and $g\big(f(x)\big)$. Then, state how these two expressions compare.
16. Let $f(x) = x + 2$ and $g(x) = x^3$. Determine the composite function $(f \circ g)(x)$.
17. Given $f(x) = x - 1$ and $g(x) = 2x + 3$, solve for x if $(f \circ g)(x) = 11$.

18. If $f(x) = 4 - x$ and $g(x) = \dfrac{x}{2}$, calculate and simplify $(f \circ g)(x)$.

19. Given $f(x) = x^2 + 1$ and $g(x) = 5 - x$, compute $(f \circ g)(2)$.

20. With $f(x) = 2x$ and $g(x) = x + 4$, first express $(f \circ g)(x)$ and $(g \circ f)(x)$. Then, find the difference $(f \circ g)(x) - (g \circ f)(x)$.

Hard Questions

21. Let $f(x) = x^2 - 2$ and $g(x) = 3x + 1$. Compute and simplify $(f \circ g)(x)$.

22. If $f(x) = \sqrt{x+1}$ and $g(x) = x - 4$, determine $(f \circ g)(x)$ and specify its domain.

23. Assume that $f(x) = x + 1$ and that $(f \circ g)(x) = 2x + 7$. Find $g(x)$.

24. Given $f(x) = \dfrac{1}{x+2}$ and $g(x) = \dfrac{x-1}{x+3}$, compute $(f \circ g)(x)$ and simplify your answer.

25. For $f(x) = 2x^2$ and $g(x) = x - 2$, find all real values of x satisfying $(g \circ f)(x) = 14$.

26. Let $f(x) = 3x - 5$ and $g(x) = x^2 + 2$. Find all values of x for which $(f \circ g)(x)$ equals $(g \circ f)(x)$.

27. Suppose $f(x) = \sqrt{x}$ and assume that $(f \circ g)(x) = x + 2$ where $g(x)$ is linear. Determine $g(x)$.

28. If $f(x) = \dfrac{1}{x-1}$ and $g(x) = \dfrac{2}{x+1}$, compute $(f \circ g)(x)$ and simplify.

29. Let $f(x) = x^3 + 1$ and $g(x) = 2x - 3$. Calculate both $(f \circ g)(-1)$ and $(g \circ f)(-1)$.

30. Given $f(x) = \dfrac{x+2}{x-1}$ and $g(x) = x - 2$, determine $(g \circ f)(x)$ and simplify the expression.