

Pre-Calculus**Composition of Functions - Page 128 #9 – 19**

In exercises 9 and 10, find $(f \circ g)(3)$ and $(g \circ f)(-2)$.

9. $f(x) = 2x - 3$; $g(x) = x + 1$

10. $f(x) = x^2 - 1$; $g(x) = 2x - 3$

In exercises 11 – 14, find $f(g(x))$ and $g(f(x))$. State the domain of each.

11. $f(x) = 3x + 2$; $g(x) = x - 1$

12. $f(x) = x^2 - 1$; $g(x) = \frac{1}{x-1}$

13. $f(x) = x^2 - 2$; $g(x) = \sqrt{x+1}$

14. $f(x) = \frac{1}{x-1}$; $g(x) = \sqrt{x}$

In exercises 15 – 19, find $f(x)$ and $g(x)$ so that the function can be described as $y = f(g(x))$.

15. $y = \sqrt{x^2 - 5x}$

16. $y = (x^3 + 1)^2$

17. $y = |3x - 2|$

18. $y = \frac{1}{x^3 - 5x + 3}$

19. $y = (x - 3)^5 + 2$

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9. 5; -6

10. 8; 3

$$11. f(g(x)) = 3(x-1) + 2 = 3x - 3 + 2 = 3x - 1$$

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

D: All real numbers OR $(-\infty, \infty)$ D: All real numbers OR $(-\infty, \infty)$

$$12. f(g(x)) = \left(\frac{1}{x-1}\right)^2 - 1 = \frac{1}{x^2-2x+1} - 1 =$$

$$\frac{1-(x^2-2x+1)}{x^2-2x+1} = \frac{-x^2+2x}{x^2-2x+1}$$

D: $(-\infty, 1) \cup (1, \infty)$ OR $(-\infty, \infty) \cap x \neq 1$

$$g(f(x)) = \frac{1}{(x^2-1)-1} = \frac{1}{x^2-2}$$

D: $(-\infty, -\sqrt{2}) \cup (-\sqrt{2}, \sqrt{2}) \cup (\sqrt{2}, \infty)$ OR $(-\infty, \infty) \cap x \neq \pm\sqrt{2}$

$$13. f(g(x)) = (\sqrt{x+1})^2 - 2 = x + 1 - 2 = x - 1$$

$$g(f(x)) = \sqrt{(3x+2)+1} = \sqrt{3x+3}$$

D: $[-1, \infty)$ D: $(-\infty, -1) \cup (1, \infty)$

$$14. f(g(x)) = \frac{1}{(\sqrt{x})-1} = \frac{1}{\sqrt{x}-1} \cdot \frac{\sqrt{x}+1}{\sqrt{x}+1} = \frac{\sqrt{x}+1}{x-1}$$

D: $[0, 1) \cup (1, \infty)$

$$g(f(x)) = \sqrt{\left(\frac{1}{x-1}\right)} = \frac{1}{\sqrt{x-1}} \cdot \frac{\sqrt{x-1}}{\sqrt{x-1}} = \frac{\sqrt{x-1}}{x-1}$$

D: $[1, \infty)$

$$15. y = \sqrt{x^2 - 5x}$$

$$f(x) = \sqrt{x}; g(x) = x^2 - 5x$$

$$16. y = (x^3 + 1)^2$$

$$f(x) = x^2; g(x) = x^3 + 1$$

$$17. y = |3x - 2|$$

$$f(x) = |x|; g(x) = 3x - 2$$

$$18. y = \frac{1}{x^3 - 5x + 3}$$

$$f(x) = \frac{1}{x}; g(x) = x^3 - 5x + 3$$

$$19. y = (x - 3)^5 + 2$$

$$f(x) = x^5 + 2; g(x) = x - 3$$