

**HOMEWORK: Operations with Functions**Perform the following operations when $f(x) = x^2 + 5x$ and $g(x) = 4x - 7$.

1. $f(x) + g(x)$ $(x^2 + 5x) + (4x - 7)$ $= \boxed{x^2 + 9x - 7}$	2. $f(x) - g(x)$ $x^2 + 5x - (4x - 7)$ $= \boxed{x^2 + x + 7}$
3. $f(x) \cdot g(x)$ $(x^2 + 5x)(4x - 7)$ $4x^3 - 7x^2 + 20x^2 - 35x$ $\boxed{4x^3 + 13x^2 - 35x}$	4. $f(x)/g(x)$ $= \boxed{\frac{x^2 + 5x}{4x - 7}}$

Evaluate the function, $f(x) = 3x^2 - 8$, for the following values or expressions.

5. $f(4)$ $f(4) = 3(4)^2 - 8$ $= \boxed{40}$	6. $f(-2)$ $f(-2) = 3(-2)^2 - 8$ $= \boxed{4}$	7. $f(0) = 3(0)^2 - 8$ $= \boxed{-8}$
8. $f(\odot)$ $= \boxed{3\odot^2 - 8}$	9. $f(\star)$ $\boxed{3\star^2 - 8}$	10. $f(\$)$ $\boxed{3\$^2 - 8}$
11. $f(2y)$ $3(2y)^2 - 8$ $3(4y^2) - 8$ $\boxed{12y^2 - 8}$	12. $f(-4m)$ $3(-4m)^2 - 8$ $3(16m^2) - 8$ $\boxed{48m^2 - 8}$	13. $f(y + 2)$ $\boxed{3(y+2)^2 - 8}$
14. $f(2x)$ $3(2x)^2 - 8$ $3(4x^2) - 8$ $\boxed{12x^2 - 8}$	15. $f(5x)$ $3(5x)^2 - 8$ $3(25x^2) - 8$ $\boxed{75x^2 - 8}$	16. $f(x - 4)$ $\boxed{3(x-4)^2 - 8}$

$$\boxed{12x^2 - 8}$$

$$\boxed{75x^2 - 8}$$

Find the following composite functions given $f(x) = x^2 - 3$ and $g(x) = 2x + 1$.

17. $f(g(x))$

$$= f(2x+1) = \boxed{(2x+1)^2 - 3}$$

18. $g(f(x))$

$$\begin{aligned} g(x^2-3) &= 2(x^2-3)+1 \\ &= 2x^2-6+1 \\ &= \boxed{2x^2-5} \end{aligned}$$

19. $f(f(x))$

$$f(x^2-3) = \boxed{(x^2-3)^2 - 3}$$

20. $g(g(x))$

$$\begin{aligned} g(2x+1) &= 2(2x+1)+1 \\ &= 4x+2+1 \\ &= \boxed{4x+3} \end{aligned}$$

Find the following composite functions given $f(x) = 2x + 9$ and $g(x) = \frac{3}{x}$.

21. $f \circ g(x)$

$$\begin{aligned} f(g(x)) &= f\left(\frac{3}{x}\right) \\ &= 2\left(\frac{3}{x}\right) + 9 \\ &= \boxed{\frac{6}{x} + 9} \end{aligned}$$

22. $g \circ f(x)$

$$\begin{aligned} g(f(x)) &= g(2x+9) \\ &= \boxed{\frac{3}{2x+9}} \end{aligned}$$

23. $f \circ f(x)$

$$\begin{aligned} f(f(x)) &= f(2x+9) \\ &= 2(2x+9) + 9 \\ &= 4x+18+9 \\ &= \boxed{4x+27} \end{aligned}$$

24. $g \circ g(x)$

$$\begin{aligned} g(g(x)) &= g\left(\frac{3}{x}\right) \\ &= \frac{3}{\frac{3}{x}} = \cancel{3} \cdot \frac{x}{\cancel{3}} \\ &= \boxed{x} \end{aligned}$$

$$-\boxed{4x+21}$$

$$=\boxed{x}$$