Warm Up

1. $1\sqrt{3} + 5\sqrt{3}$

$6\sqrt{3}$

2. $4\sqrt{8} + 3\sqrt{2}$

$\sqrt{8} =$

8
4 2
2 2

$8\sqrt{2} + 3\sqrt{2}$

$11\sqrt{2}$

3. $\sqrt[3]{4} \cdot \sqrt[3]{6}$

24
4 6
2 2 2 3

$\sqrt[3]{4 \cdot 6} = \sqrt[3]{24}$

$2\sqrt[3]{3}$

4. $\dfrac{\sqrt[4]{32}}{\sqrt[4]{2}}$

$\sqrt[4]{\dfrac{32}{2}}$

$\sqrt[4]{16} = 2$

16
4 4
2 2 2 2

5. $\dfrac{2}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}}$

$\dfrac{2\sqrt{3}}{3}$

6. $\dfrac{\sqrt{2}}{\sqrt{5}} \cdot \dfrac{\sqrt{5}}{\sqrt{5}}$

$\dfrac{\sqrt{10}}{5}$

10
2 5

$\sqrt{a} \cdot \sqrt{a} = a$

Combination of Functions

If $f(x)$ and $g(x)$ both exist, the sum, difference,product, quotient and composition of two functions f and g are defined by

$$(f+g)(x) = f(x) + g(x)$$

$$(f-g)(x) = f(x) - g(x)$$

$(f \cdot g)(x)$ $$(fg)(x) = f(x) \cdot g(x)$$

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} \text{ where } g(x) \neq 0$$

Functions: $f(x) = x^2 - 3x$ $g(x) = 2x^2 + 4$ $h(x) = 5x - 1$

Operations: $+$ $-$ $*$ $\overline{}$

$f(x) =$ $g(x) =$ $h(x) =$ (5x - 1

(5x - 1

$-$ $=$ $=$ ____ ____ $*$

f(x) + g(x) $+$ $= 3x^2 - 3x + 4$

g(x) + f(x) $(2x^2 + 4) + (x^2 - 3x) = 3x^2 - 3x + 4$

f(x) - g(x) $(x^2 - 3x) - (2x^2 + 4) = -x^2 - 3x - 4$

Sum, Difference, Product, and Quotient of Functions

Let f and g be two functions with overlapping domains. Then, for all x common to both domains, the *sum*, *difference*, *product*, and *quotient* of f and g are defined as follows.

1. *Sum:* $(f + g)(x) = f(x) + g(x)$
2. *Difference:* $(f - g)(x) = f(x) - g(x)$
3. *Product:* $(fg)(x) = f(x) \cdot g(x)$
4. *Quotient:* $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \quad g(x) \neq 0$

Find (a) (f +g)(x), (b) (f – g)(x), (c) (fg)(x), and (f/g)(x)

f(x) = 2x - 5, g(x) = 1 - x

a.) $(f+g)(x) = 2x-5 + 1-x = x-4$

b.) $(f-g)(x) = 2x-5-(1-x) = 3x-6$

c.) $(fg)(x) = (2x-5)(1-x)$

$2x-2x^2-5+5x$

$(fg)(x) = -2x^2+7x-5$

$\left(\frac{f}{g}\right)(x) = \frac{2x-5}{1-x}$

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2. *Difference:* $(f - g)(x) = f(x) - g(x)$

3. *Product:* $(fg)(x) = f(x) \cdot g(x)$

4. *Quotient:* $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \quad g(x) \neq 0$

Let $f(x) = x^2 + 1$ and $g(x) = 3x + 5$

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

$(f - g)(-3)$ $\quad (f-g)(-3) = x^2 - 3x - 4$

$(-3)^2 - 3(-3) - 4$

$9 + 9 - 4$

$(f-g)(-3) = 14$

Sum, Difference, Product, and Quotient of Functions

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1. *Sum:* $(f + g)(x) = f(x) + g(x)$
2. *Difference:* $(f - g)(x) = f(x) - g(x)$
3. *Product:* $(fg)(x) = f(x) \cdot g(x)$
4. *Quotient:* $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \quad g(x) \neq 0$

Let $f(x) = x^2 + 1$ and $g(x) = 3x + 5$

$(f \cdot g)(5)$

$(x^2+1)(3x+5)$

$3x^3+5x^2+3x+5$

$3(5)^3+5(5)^2+3(5)+5$

$375+125+15+5$

520

Perform the indicated operation.

1) $h(n) = 2n + 1$
$g(n) = n^2 + 4n$
Find $h(n) + g(n)$

$n^2 + 6n + 1$

2) $h(t) = t + 3$
$g(t) = t^2 + 1$
Find $h(t) - 2g(t)$

$-2t^2 + t + 1$

$t + 3 - 2(t^2 + 1)$

3) $g(n) = -n^2 - 3$
$h(n) = 3n + 2$
Find $g(n) \cdot h(n)$

$-3n^3 - 2n^2 - 9n - 6$

$(-n^2 - 3)(3n + 2)$

4) $g(a) = -a + 5$
$h(a) = a^3 + 4$
Find $g(a) + h(a)$

$a^3 - a + 9$

$-a + 5 + a^3 + 4$

5) $f(x) = -2x - 3$
$g(x) = x^3 + 3$
Find $f(x) \cdot g(x)$

$-2x^4 - 3x^3 - 6x - 9$

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

$x^2 + 5x - 1$

7) $g(n) = n - 2$
$h(n) = -n^2 + 5n$
Find $g(n) + h(n)$

$-n^2 + 6n - 2$

8) $h(a) = a^2 + 5$
$g(a) = 3a - 5$
Find $h(a) \cdot g(a)$

$3a^3 - 5a^2 + 15a - 25$

9) $g(t) = 2t + 2$
$h(t) = t^2 - 3t$
Find $g(t) + h(t)$

[redacted]

10) $h(t) = 4t + 3$
$g(t) = 2t^3 + 1$
Find $h(t) \cdot g(t)$

[redacted]

11) $f(x) = x - 5$
$g(x) = 2x$
Find $f(x) \cdot g(x)$

[redacted]

12) $h(x) = -x + 1$
$g(x) = x^2 - 1$
Find $2h(x) - g(x)$

[redacted]