

## Operations on Functions

- 1) Let's Go Over the Homework and finish p.3
- 2) Take little quiz on simplifying radicals and re-writing the forms
- 3) Notes on Operations of Functions

Refresher:

$$\text{If } f(x) = 3x^2 + 2x - 4$$

Find  $f(3)$

Find  $f(x+1)$

Ex: Let  $f(x) = 3x + 2$  and  $g(x) = 4 - 5x$

Find:

$$\begin{aligned} f(x) + g(x) &= (3x + 2) + (4 - 5x) = 3x + 2 + 4 - 5x = -2x + 6 \\ f(x) - g(x) &= (3x + 2) - (4 - 5x) = 3x + 2 - 4 + 5x = 8x - 2 \\ f(x) * g(x) &= (3x + 2)(4 - 5x) = 12x - 15x^2 + 8 - 10x = -15x^2 + 2x + 8 \\ \frac{f(x)}{g(x)} &= \frac{3x + 2}{4 - 5x} \end{aligned}$$

a)  $f(x) + g(x)$

b)  $f(x) - g(x)$

c)  $f(x) * g(x)$

d)  $\frac{f(x)}{g(x)}$

Try another. Find the sum, difference, product and quotient with the given.

$$f(x) = x^2 - 4 \quad | \quad g(x) = 3x + 1$$

$f(x) = x^2 - 4$	$g(x) = 3x + 1$
------------------	-----------------

**Sum**

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

$$(x^2 - 4) + (3x + 1)$$

$$x^2 - 4 + 3x + 1$$

$$x^2 + 3x - 3$$

**Product**

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

$$(x^2 - 4)(3x + 1)$$

$$3x^3 + x^2 - 12x - 4$$

**Difference**

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

$$(x^2 - 4) - (3x + 1)$$

$$x^2 - 4 - 3x - 1$$

$$x^2 - 3x - 5$$

**Quotient**

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$$

$$\frac{x^2 - 4}{3x + 1}$$

**ADDING & SUBTRACTING RADICALS**

- ① **SIMPLIFY** all radicals.

---

- ② Identify radicals with the **SAME INDEX** and **SAME RADICAND**. Only these can be combined!

---

- ③ For common radicals, **add/subtract the coefficients** and **KEEP THE COMMON RADICAL**.

1.  $3\sqrt{27} - 2\sqrt{12}$

2.  $3\sqrt[3]{54} - 2\sqrt{2} + 7\sqrt[3]{-16}$

3.  $7\sqrt[4]{48} - 2\sqrt[4]{3} + 3\sqrt[3]{72}$

4.  $10\sqrt{28} + \sqrt[3]{-56} - 4\sqrt{175}$

# Multiplying Radicals

① Multiply coefficients, then use the **PRODUCT RULE**:  $\sqrt[n]{a} \cdot \sqrt[n]{b} =$

② **SIMPLIFY** the resulting radical.

1)  $\sqrt{27} \cdot \sqrt{5}$

2)  $3\sqrt{10} \cdot -2\sqrt{18}$

$$\frac{\sqrt{27} \cdot \sqrt{5}}{\sqrt{27 \cdot 5}} = \sqrt{135} \quad \left| \quad \frac{3\sqrt{10} \cdot -2\sqrt{18}}{-6\sqrt{180}} = -2\sqrt{5}$$

3)  $\sqrt{6x^4} \cdot 5\sqrt{8x^5}$

4)  $\sqrt[3]{-3a^7b^4} \cdot \sqrt[3]{36a^6b^2}$

$$\frac{\sqrt{6x^4} \cdot 5\sqrt{8x^5}}{5\sqrt{48x^9}} = \sqrt{3x} \quad \left| \quad \frac{\sqrt[3]{-3a^7b^4} \cdot \sqrt[3]{36a^6b^2}}{\sqrt[3]{-108a^{13}b^6}} = -\sqrt[3]{\frac{a}{3b}}$$

Try These:

a)  $\sqrt{10}(5\sqrt{5} - 2\sqrt{2})$

b)  $(8 - \sqrt{10})(3 - \sqrt{10})$

$$\frac{\sqrt{10}(5\sqrt{5} - 2\sqrt{2})}{5\sqrt{50} - 2\sqrt{20}} = \sqrt{50} - \sqrt{20} \quad \left| \quad \frac{(8 - \sqrt{10})(3 - \sqrt{10})}{24 - 8\sqrt{10} - 3\sqrt{10} + 10} = 14 - 11\sqrt{10}$$

## Operations with Radical Functions

Find the sum, difference, product and quotient with the given.

$f(x) = 5\sqrt{2x} + 1$	$g(x) = 3\sqrt{2x} - 1$
-------------------------	-------------------------

$f(x) = 5\sqrt{2x} + 1$	$g(x) = 3\sqrt{2x} - 1$
-------------------------	-------------------------

**Sum**

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

$$(5\sqrt{2x} + 1) + (3\sqrt{2x} - 1)$$

$$5\sqrt{2x} + 1 + 3\sqrt{2x} - 1$$

$$\boxed{8\sqrt{2x}}$$

**Difference**

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

$$(5\sqrt{2x} + 1) - (3\sqrt{2x} - 1)$$

$$5\sqrt{2x} + 1 - 3\sqrt{2x} + 1$$

$$\boxed{2\sqrt{2x} + 2}$$

**Product**

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

$$(5\sqrt{2x} + 1)(3\sqrt{2x} - 1)$$

$$15(2x) - 5\sqrt{2x} + 3\sqrt{2x} - 1$$

$$\boxed{30x - 2\sqrt{2x} - 1}$$

**Quotient**

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$$

$$\boxed{\frac{5\sqrt{2x} + 1}{3\sqrt{2x} - 1}}$$

### Operations with Rational Exponent Form

$$f(x) = 10x^{1/2} \quad | \quad g(x) = 5x^{1/2}$$

$f(x) = 10x^{1/2}$	$g(x) = 5x^{1/2}$
--------------------	-------------------

Sum

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

$$10x^{1/2} + 5x^{1/2}$$

$$\underline{15x^{1/2}}$$

Product

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

$$10x^{1/2} \cdot 5x^{1/2}$$

$$50x^{1/2+1/2} = \underline{50x}$$

Difference

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

$$10x^{1/2} - 5x^{1/2}$$

$$\underline{5x^{1/2}}$$

Quotient

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$$

$$\frac{10x^{1/2}}{5x^{1/2}} = 2x^{1/2-1/2} = 2x^0 = 2(1) = \underline{2}$$

# HW :wkst on Operations with Functions