Warm Up

1) The product $(2x^4y)(3x^5y^8)$ is equivalent to:

F. $5x^9y^9$
G. $6x^9y^8$
H. $6x^9y^9$
J. $5x^{20}y^8$
K. $6x^{20}y^8$

Simplify the expression.

2) $y^2\sqrt[5]{64x^6} - 6\sqrt[5]{2x^6y^{10}}$

$\sqrt[5]{32}\,\sqrt[5]{2}$

$2\,y^2x^1\sqrt[5]{2x} - 6x^1y^2\sqrt[5]{2x}$

$-4\,x^1y^2\sqrt[5]{2x}$

Simplify the expression.

3) $6\sqrt[3]{5} + 4\sqrt[3]{625}$

$4\cdot\sqrt[3]{125}\sqrt[3]{5}$
5

$6\sqrt[3]{5} + 20\sqrt[3]{5}$

$26\sqrt[3]{5}$

4) Write in simplest form.

$\sqrt[3]{\dfrac{x}{y^9}}$

$\dfrac{\sqrt[3]{x}}{\sqrt[3]{y^9}}$

$\boxed{\dfrac{\sqrt[3]{x}}{y^3}}$

6 $\left(-\frac{1}{361}\right)^{-1/2}$

$\left(-\frac{361}{1}\right)^{1/2}$

$\sqrt{-361}$

N.S.

15 $1^{-3/4}$

$\frac{1}{1^{3/4}}$

1

30 $\left(\frac{1}{100{,}000}\right)^{3/5} = \frac{1}{1{,}000}$

$\frac{1}{\left(\sqrt[5]{100{,}000}\right)^3}$

10^2 10^3 10^4 10^5

100 1000 10,000 100,000

4 $(-4)^{-5/2}$

$(\sqrt{-4})^5$

N.S.

23 $-64^{5/6} = -32$

$-1 \cdot 64^{5/6}$

$-1 \quad 2^5$

9 $\left(-\frac{1}{125}\right)^{4/3}$

$\frac{1}{(\sqrt[3]{-125})^4}$

$\frac{1}{(-5)^4} = \frac{1}{625}$

18 $-400^{-1/2}$

$-1 \cdot 400^{-1/2}$

$\frac{1}{-1 \cdot 400^{1/2}} = \frac{1}{-1 \cdot \sqrt{400}}$

$\frac{1}{-20}$

41 $\left(\frac{1}{169}\right)^{-1/2}$

$\left(\frac{169}{1}\right)^{1/2}$

$\sqrt{169} = 13$

1) $3^{3/4} \cdot 3^{5/4}$

$3^{8/4} = 3^2 = 9$

b) $\frac{4^{3/2}}{4^{1/2}} = 4^{1/2} = 2$

$\frac{3}{2} + \frac{1 \cdot 2}{2}$

2) $(x^2)^{1/4}$

$x^{2/4} = x^{1/2} = \sqrt{x}$

b) $\frac{x^{2/3} y^{-2/5}}{x^{1/3} y^{7/5}}$

$x^{1/3} y^{-9/5}$

$\frac{x^{1/3}}{y^{9/5}}$

3 $\sqrt[3]{2}\,\sqrt[3]{4}$

$\sqrt[3]{8} = 2$

$\frac{\sqrt{72}}{\sqrt{2}} = \sqrt{\frac{72}{2}} = \sqrt{36}$

6

4 $\sqrt[2]{8x^7}$

$\sqrt{4}\,\sqrt{2}$

$2x^3\sqrt{2x}$

5 $\sqrt[4]{2xy^3}\,\sqrt[4]{8x^3y^2}$

$\sqrt[4]{16x^4y^5}$

$2x^1y^1\sqrt[4]{y}$

(1) $\sqrt{20} + \sqrt{5}$

$\sqrt{4}\sqrt{5} + \sqrt{5}$

$2\sqrt{5} + \sqrt{5}$

$3\sqrt{5}$

(2) $10\sqrt[4]{32} - 3\sqrt[4]{2}$

$10\sqrt[4]{16}\sqrt[4]{2} - 3\sqrt[4]{2}$

$10 \cdot 2\sqrt[4]{2} - 3\sqrt[4]{2}$

$20\sqrt[4]{2} - 3\sqrt[4]{2}$

$17\sqrt[4]{2}$

(3) $7\sqrt[3]{54} + 4\sqrt[3]{128}$

$7\sqrt[3]{27}\sqrt[3]{2} + 4\sqrt[3]{64}\sqrt[3]{2}$

$7 \cdot 3\sqrt[3]{2} + 4 \cdot 4\sqrt[3]{2}$

$21\sqrt[3]{2} + 16\sqrt[3]{2}$

$37\sqrt[3]{2}$

(4) $5\sqrt[3]{x^4} + 2\sqrt[3]{x}$

$5x\sqrt[3]{x} + 2\sqrt[3]{x}$

Quick Check

*Evaluation flashcards at your table.

★ Mad Minute Practice WS

*Let's look at few

-negative exponents

-negative inside the parentheses

-negative without parentheses

Homework Questions

6.3 Perform Function Operations & Compositions

Objectives:

- Perform operations with functions including composition of functions
- Determine how domain and range are affected by function operation

Operations on Functions

Let $f(x)$ and $g(x)$ be any two functions. You can add, subtract, multiply, or divide $f(x)$ and $g(x)$ to form a new function $h(x)$.

Operation	Definition	Example Let $f(x) = 2x$ and $g(x) = x + 1$.
Addition	$h(x) = f(x) + g(x)$	$h(x) = 2x + (x + 1) = 3x + 1$
Subtraction	$h(x) = f(x) - g(x)$	$h(x) = 2x - (x + 1) = x - 1$
Multiplication	$h(x) = f(x) \cdot g(x)$	$h(x) = (2x)(x + 1) = 2x^2 + 2x$
Division	$h(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$	$h(x) = \frac{2x}{x + 1}, x \neq -1$

The domain of h consists of the x-values that are in the domains of both f and g. When h involves division, the domain does not include x-values for which the denominator is equal to zero.

Operations on Functions

Let $f(x)=-2x^{2/3}$ and $g(x)=7x^{2/3}$. Find the following.

1. $f(x) + g(x)$

$-2x^{2/3} + 7x^{2/3}$

$5x^{2/3}$

2. $f(x) - g(x)$

$-2x^{2/3} - 7x^{2/3}$

$-9x^{2/3}$

6.3 Perform Function Operations & Compositions

How are domain and range affected by function operations?

Operations on Functions

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6.3 Perform Function Operations & Compositions

An Extra Rule for Division...

$(f/g)(x)=f(x)/g(x)$ $\qquad$ $g(x)\neq 0$

$f(x)=\sqrt{x}$ $\qquad$ $g(x)=\sqrt{3-x}$

D:

$$\frac{\sqrt{x}}{\sqrt{3-x}} = \sqrt{\frac{x}{3-x}}$$

Operations on Functions

Let $f(x) = 3x$ and $g(x) = x^{1/5}$. Find the following.

$\frac{5\cdot 1}{5\cdot 1} - \frac{1}{5} = \frac{4}{5}$

1. $f(x) \bullet g(x)$

$3x^{1} \cdot 1x^{1/5}$

$\frac{5\cdot 1}{5\cdot 1} + \frac{1}{5} = \frac{6}{5}$

$3x^{6/5}$

2. $\frac{f(x)}{g(x)}$ $\frac{3x}{x^{1/5}} = 3x^{4/5}$

TOYO

Find a. $(f+g)(x)$ b. $(f-g)(x)$ c. $(fg)(x)$ d. $(f/g)(x)$

1. $f(x)=x^2+5$, $g(x)=1-x$

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

$x^2+5+1-x$

x^2-x+6

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

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

x^2+x+4

c) $(x^2+5)(1-x)$

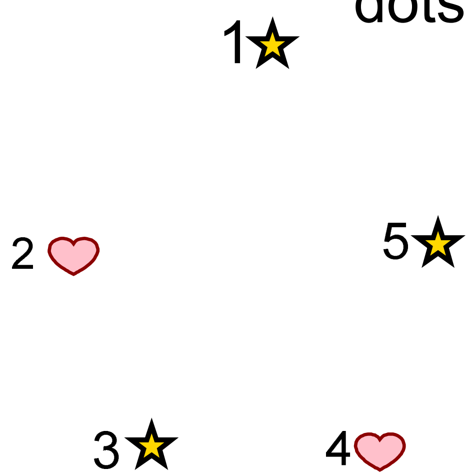
x^2-x^3+5-5x

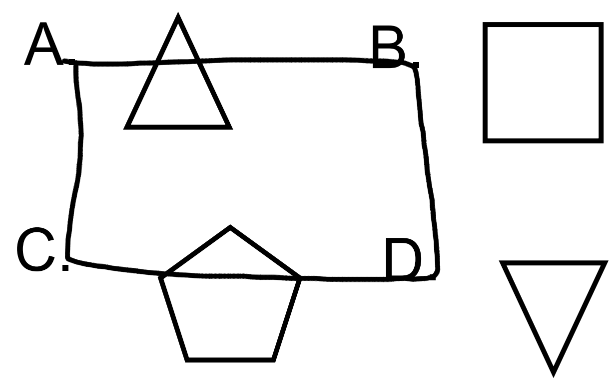
$-x^3+x^2-5x+5$

d) $\dfrac{x^2+5}{1-x}$

$\dfrac{x^2}{x}=x$

What shape do you get when you connect the dots?





Composition of Functions

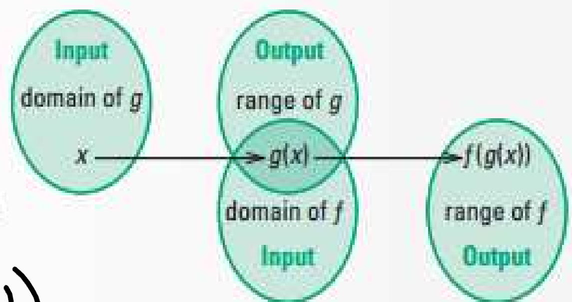
What is a composition?

COMPOSITION OF TWO FUNCTIONS

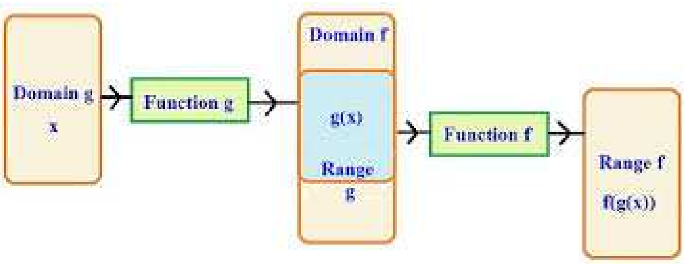
The **composition** of the function f with the function g is:

$$h(x) = f(g(x))$$

The domain of h is the set of all x-values such that x is in the domain of g and $g(x)$ is in the domain of f.



$h(x) = f(g(x))$



Composition of Functions

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

Together they create (f o g)(x). or $f(g(x))$

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

$f(g(1)) = 2(1) + 1$

$= 2 + 1$

$= 3$

1, 2, 3, 4
Domain of g(x)
(the x's available)

Domain of (f o g)(x)

"I'm function g(x). I'll pick up the values from the blue area, multiply them all by 2, and drop them off in the yellow area."

Range of g(x)
(the y's used)
2, 4, 6, 8
Domain of f(x)

"I'm function f(x). I'll pick up the values from the yellow area, add 1 to each value, and drop them off in the green area."

3, 5, 7, 9
Range of f(x)

Range of (f o g)(x)

Just remember that (f o g)(x) is really f(g(x)), so start with the innermost parentheses.

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

⑦ $\cancel{f}(\cancel{g}(h(x)))$

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

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

$6x^2+6-1$

$6x^2+5$

④ $h(f(x))$

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

$(2x-1)(2x-1) + 1$

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

$4x^2-4x+2$

(10) $g(f(x))$ $g(x) = x^2 + x$ $f(x) = 9-x$

$(9-x)^2 + (9-x)$

$(9-x)(9-x)$

$81 - 18x + x^2 + 9 - x$

$x^2 - 19x + 90$

Composition WS

COMPOSITION OF FUNCTIONS Let $f(x) = 4x^{-5}$ and $g(x) = x^{3/4}$. Perform the indicated operation and state the domain.

28. $f(g(x))$ 29. $g(f(x))$ 30. $f(f(x))$ 31. $g(g(x))$

Let $f(x) = 3x - 8$ and $g(x) = 2x^2$. Find the following.

8. $g(f(5))$ 9. $f(g(5))$ 10. $f(f(5))$ 11. $g(g(5))$

12. Let $f(x) = 2x^{-1}$ and $g(x) = 2x + 7$. Find $f(g(x))$, $g(f(x))$, and $f(f(x))$. Then state the domain of each composition.

8

$g(f(5))$
$2(3(5)-8)^2$
$2(15-8)^2$
$2(7)^2$
$2(49)$
98

$f(g(5))$
$3(2(5)^2) - 8$
$3(2(25)) - 8$
$3(50) - 8$
$150 - 8$
142

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*Flash Cards

Mad Minute Quiz

Homework

- Page 432 #22-25, 28-37, 39, 44(don't skip), 45 (don't skip)
- Compostion WS

- Mad Minute Quiz Thursday