| Section 1.4 part 1 | Combinations of Functions |
|---|---|
| Objective: | Given an arithmetic combination of a functions students will be able towrite its solution and find the new domain. |

Quiz Thursday

Study Problems
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Due Thursday

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## Warm-up

*Given* $f(x)=x^2+2x$ *and* $g(x)=2x+1$, *find*:

*a.* $f(x)+g(x)=$ $x^2+2x+2x+1=x^2+4x+1$

*b.* $(f-g)(x)=$ $x^2+2x-(2x+1)=x^2-1$

*c.* $(f\cdot g)(x)=$ $(x^2+2x)(2x+1)=2x^3+5x^2+2x$

*d.* $\dfrac{f(x)}{g(x)}=$ $\dfrac{x^2+2x}{2x+1}$ $\dfrac{x(x+2)}{2x+1}$

*e.* $(f\circ g)(x)=$ $f(g(x))=$

*a.* $x^2+4x+1$

*b.* $x^2-1$

*c.* $2x^3+5x^2+2x$

*d.* $\dfrac{x^2+2x}{2x+1}=\dfrac{x(x+2)}{2x+1}$

*e.* $(2x+1)^2+2(2x+1)$

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

$4x^2+8x+3$

If we are asked to find the following:Which will be different? explain

Given $f(x) = x^2 + 2x$ and $g(x) = 2x + 1$, find:

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

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

c. $(g \cdot f)(x) = (2x+1)(x^2+2x) = 2x^3+5x^2+2x$

d. $\frac{g(x)}{f(x)} = \frac{2x+1}{x^2+2x}$

e. $(g \circ f)(x) = 2(x^2+2x)+1 = 2x^2+4x+1$

## Notation for arithmetic combinations

| Addition | Multiplication |
|---|---|
| $(f+g)(x) = f(x) + g(x) = f+g$ | $(f \cdot g)(x) = f(x) \cdot g(x) = f \cdot g$ |
| **Subtraction** | **Division** |
| $(f-g)(x) = f(x) - g(x) = f-g$ (Distribute the negative) | $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{f}{g}$ |

## Composition of functions

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

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

Change all x's in f for the funct. g.

## Example

Let $f(x)=\sqrt{5x-4}$ and $g(x)=3x^2$ ⇐

Find $g(f(1))$

Find $f(g(-3))$

Find $g(g(2))$

How do you find the value of $f(g(6))$?

Method 1:

$3(\sqrt{5x-4})^2$

$3(5x-4)$

$15x-12$

$15(1)-12$

$15-12$

$3$

Method 2:

$g(f(1))$

$f(1)=\sqrt{5(1)-4}$

$f(1)=1$

$g(1)=3(1)^2$

$=3(1)=3$

$f(g(-3))$

$g(-3)=3(-3)^2=27$

$f(27)=\sqrt{5(27)-4}$

$=\sqrt{135-4}=\sqrt{131}$