

COLLEGE ALGEBRA

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GPS #19

2.6 COMBINING FUNCTIONS: COMPOSITE FUNCTIONS

Class Time: 11:30

Date: 2-14-08

Useful Definitions:

If $f(x)$ and $g(x)$ define functions, then

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

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

* $(fg)(x) = f(x)g(x)$

[The domain of the new function is the intersection of the domains of $f(x)$ and $g(x)$.]

* $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$

[The domain of the quotient function is the intersection of the domains of $f(x)$ and $g(x)$, excluding any values of x where $g(x) = 0$.]

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no sub!

1. For each pair of functions, find $(f + g)(x)$, $(f - g)(x)$ and $(fg)(x)$. Give the domain.

$f(x) = 3x - 4$ and $g(x) = -5x + 1$

$$\begin{aligned} (f + g)(x) &= f(x) + g(x) \\ &= (3x - 4) + (-5x + 1) \\ &= -2x - 3 \end{aligned}$$

domain = $(-\infty, \infty)$

$$\begin{aligned} (f - g)(x) &= f(x) - g(x) \\ &= (3x - 4) - (-5x + 1) \\ &= 8x - 5 \end{aligned}$$

domain = $(-\infty, \infty)$

$$\begin{aligned} (fg)(x) &= (3x - 4)(-5x + 1) \\ &= -15x^2 + 3x + 20x - 4 \\ &= -15x^2 + 23x - 4 \end{aligned}$$

domain: $(-\infty, \infty)$

2. Let $f(x) = 7x - 3$, $g(x) = -x^2 + 2$ and $h(x) = -x$. Find the following.

a) $(f + g)(x) = (7x - 3) + (-x^2 + 2)$
 $= -x^2 + 7x - 1$

c) $(g - h)(x) = (-x^2 + 2) - (-x)$
 $= -x^2 + x + 2$

e) $(fg)(x) = (7x - 3)(-x^2 + 2)$
 $= -7x^3 + 3x^2 + 14x - 6$

g) $(gh)(x) = (-x^2 + 2)(-x)$
 $= x^3 - 2x$

b) $(f + g)(2) = (7(2) - 3) + (-2^2 + 2)$
 $= 11 - 2 = 9$

d) $(g - h)(-3) = (-(-3)^2 + 2) - (-(-3))$
 $= -9 + 2 - 3 = -10$

f) $(fg)(2) = (7(2) - 3)(-2^2 + 2)$
 $= 11(-2) = -22$

h) $(gh)(-1) = (-(-1)^2 + 2)(-(-1))$
 $= (-1 + 2)(1) = 1$

3. Find the quotient $\left(\frac{f}{g}\right)(x)$ and give the domain.

$f(x) = -10x^2 + 5x$ and $g(x) = -5x + 5$

$$\begin{aligned} \left(\frac{f}{g}\right)(x) &= \frac{-10x^2 + 5x}{-5x + 5} = \frac{5x(-2x + 1)}{5(-x + 1)} = \frac{x(-2x + 1)}{-x + 1} \end{aligned}$$

domain: $\{x \mid x \neq 1\}$ or $(-\infty, 1) \cup (1, \infty)$

4. Let $f(x) = 6x - 3$ and $h(x) = 3x$. Find the following.

a) $\left(\frac{f}{h}\right)(x) = \frac{6x - 3}{3x} = \frac{3(2x - 1)}{3x} = \frac{2x - 1}{x}$

b) $\left(\frac{f}{h}\right)(-2) = \frac{2(-2) - 1}{-2} = \frac{-5}{-2} = \frac{5}{2}$