Tuesday, October 16, 2018
5:22 PM

Precalc KEY 1.8A: Combinations of functions

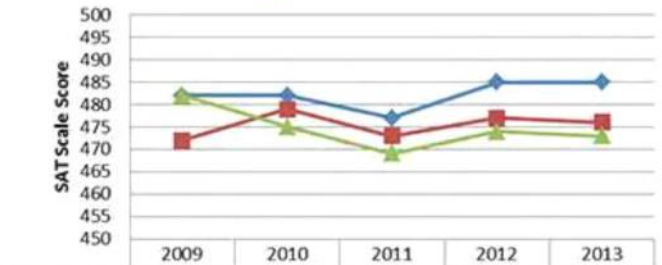
Obj: To combine functions algebraically & graphically, evaluate them, and find their new domain.

Hwk: 1.8A #1 & 3 (make table), 9 – 23 odd; Check answers!!

Quiz 1.6 – 1.8 is coming!

Do Now:

Find the average SAT score for each year, 2009 - 2013:



	2009	2010	2011	2012	2013
Reading	482	482	477	485	485
Math	472	479	473	477	476
Writing	482	475	469	474	473

Average SAT Scores within ACPS: 2009-2013

2009: $\frac{482+472+482}{3} = 479$

2010: $\frac{482+479+475}{3} = 479$

2011: $\frac{477+473+469}{3} = 473$

2012: $\frac{485+477+474}{3} = 479$

2013: $\frac{485+476+473}{3} = 478$

When done:

Simplify:

1. $(x-2)+(x^2-4)$ x^2+x-6

2. $(x^2-4)-(x-2)$ $x^2-4-x+2 = x^2-x-2$

3. $(x-2)(x^2-4)$ $x^3-4x-2x^2+8 = x^3-2x^2-4x+8$

4. $(x^2-4)\div(x-2)$ $\frac{x^2-4}{x-2} = \frac{(x+2)(x-2)}{(x-2)} = x+2$

Today we are adding, subtracting, multiplying, and dividing functions – just as we simplified the polynomials above.

Let $f(x) = x-2$; $g(x) = x^2-4$

1. $(x-2)+(x^2-4)$ $f+g$
2. $(x^2-4)-(x-2)$ $g-f$
3. $(x-2)(x^2-4)$ $f \cdot g$
4. $(x^2-4)\div(x-2)$ $g \div f$

Let f & g be functions

Sum: $(f+g)(x) = f(x) + g(x)$ ← combine like terms

Difference: $(f-g)(x) = f(x) - g(x)$ ← distribute negative, combine like terms

Product: $(f \bullet g)(x) = (fg)(x) = f(x) \bullet g(x)$ ← FOIL if 2 binomials

Quotient: $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \; g(x) \neq 0$ ← domain: $g(x) \neq 0$ THEN cancel factors

***Any restrictions on the domains of f & g and the resulting function must be considered! (usually the SMALLEST or MOST RESTRICTIVE DOMAIN)**

Ex.1) $f(x) = x^2$; $g(x) = \sqrt{4x-5}$

$\left(\frac{f}{g}\right)(2) = ?$

$\frac{f(2)}{g(2)} = \frac{(2)^2}{\sqrt{4(2)-5}}$

$= \frac{4}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{4\sqrt{3}}{3}}$

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

$\frac{f(x)}{g(x)} = \frac{x^2}{\sqrt{4x-5}} \cdot \frac{\sqrt{4x-5}}{\sqrt{4x-5}}$

$= \boxed{\frac{x^2\sqrt{4x-5}}{4x-5}}$

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

$\frac{g(x)}{f(x)} = \frac{\sqrt{4x-5}}{x^2}$

Find the domain of each combined function.

$4x-5 > 0$

$4x > 5$

$x > \frac{5}{4}$

D: $(5/4, \infty)$

$4x-5 \geq 0$ and $x^2 \neq 0$

$4x \geq 5$

$x \geq 5/4$

$x \neq 0$

D: $[5/4, \infty)$

Ex. 2) f: {(-2,1), (3, -5), (1, 7)}, g:{(-2, 6), (3, 9), (1, -7)},

Find f + g

x	f(x)
-2	1
3	-5
1	7

x	g(x)
-2	6
3	9
1	-7

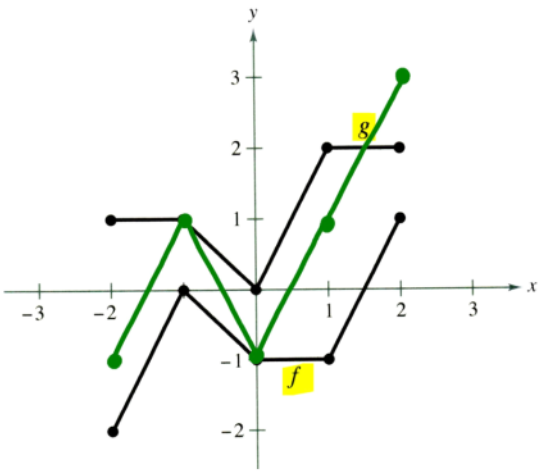
f+g

x	f(x) + g(x)
-2	1 + 6 = 7
3	-5 + 9 = 4
1	7 + -7 = 0

$\{(-2,7), (3,4), (1,0)\}$

You can also evaluate functions and perform operations using a graph.

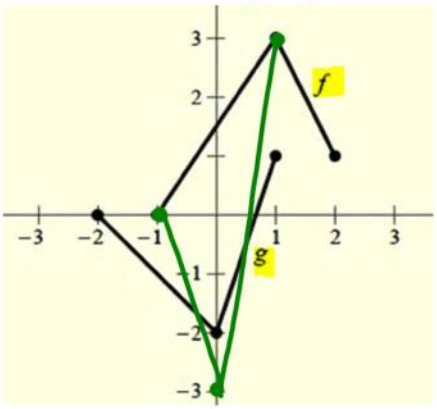
Ex. 3) Using the graph below, find and graph h(x) = (f + g)(x)



Make a chart!

x	f(x)	g(x)	(f + g)(x)
-2	-2	1	-2 + 1 = -1
-1	0	1	0 + 1 = 1
0	-1	0	-1 + 0 = -1
1	-1	2	-1 + 2 = 1
2	1	2	1 + 2 = 3

Ex. 4) Use the graphs of f and g to find (fg)(x)



x	f(x)	g(x)	(fg)(x)
−2	undef.	0	undef.
−1	0	−1	0
0	1, 5	−2	−3
1	3	1	3
2	1	undef.	undef.

Ex. 5) Evaluate the indicated functions for

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

a) $(f + g)(5)$

$f(5) = (5)^2 - 2 = 23$

$g(5) = 2(5) + 1 = 11$

$f(5) + g(5) = 23 + 11 = \boxed{34}$

b) $(f - g)(2r)$

$f(2r) = (2r)^2 - 2 = 4r^2 - 2$

$g(2r) = 2(2r) + 1 = 4r + 1$

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

$= \boxed{4r^2 - 4r - 3}$

c) $(fg)(-2)$

$f(-2) = (-2)^2 - 2 = 4 - 2 = 2$

$g(-2) = 2(-2) + 1 = -3$

$f(-2) \cdot g(-2) = 2 \cdot -3 = \boxed{-6}$

d) $\left(\frac{f}{g}\right)(-4)$

$f(-4) = (-4)^2 - 2 = 16 - 2 = 14$

$g(-4) = 2(-4) + 1 = -7$

$\frac{f(-4)}{g(-4)} = \frac{14}{-7} = \boxed{-2}$