7.2b Combining Functions

What did you learn in Lesson 7.2?

Domain: The combined function is restricted to the intersection of the domains of f(x) and g(x). Common Domain

Range: The combined function can be found by combining the y-values for the combined function f(x) and g(x).

Ex 1: If f={(-3,2), (5,-10),(0,-3),(6,1)} and g={(1,-10),(6,2), (4,0), (5,7)},

a) Find the common domain

$D = \{5, 6\}$

b) Determine:

i) (fxg)(x)

$= f(x)g(x)$

$= fg(x)$

$= \{(5, -10 \times 7), (6, 1 \times 2)\}$

$= \{(5, -70), (6, 2)\}$

ii) (g÷f)(x)

$= \frac{g}{f}(x)$ OR $= \frac{g(x)}{f(x)}$

$= \left\{\left(5, -\frac{7}{10}\right), (6, 2)\right\}$

Jan 4-8:54 PM

Ex 2: If $f(x) = \frac{1}{4x-8}$ and $g(x) = \sqrt{-x+6}$

a) Find the common domain

$D_f \Rightarrow 4x-8=0$, $x=2$, $x \neq 2$

$D_G \Rightarrow -x+6 \geq 0$, $-x \geq -6$, $x \leq 6$

$$D = \{x \in \mathbb{R} \mid x \leq 6, x \neq 2\}$$

b) Determine:

i) (fg)(x)

$= \frac{1}{4x-8}\left(\sqrt{-x+6}\right)$

$= \frac{\sqrt{-x+6}}{4x-8}$, $x \leq 6$ & $x \neq 2$

ii) (g÷f)(x)

$= \frac{\sqrt{-x+6}}{\frac{1}{4x-8}}$

$= \sqrt{-x+6}(4x-8)$, $x \neq 2$ & $x \leq 6$

Key Features of Combining Functions:

1) Even/Odd functions

even±even= even
odd±odd= odd
even±odd= neither

oddxodd= even
evenxeven= even
oddxeven= odd

2) Zeros:

a) if you are adding or subtracting a function with a zero, the sum or difference at that x value will be the value (y-value)of the other function

if f(x) = 0 ⟶ f(x)+g(x)=g(x)
if g(x) = 0 ⟶ f(x)+g(x)=f(x)

Add/Subtract a zero? DOES NOTHING!

b) if you are multiplying a function with a zero, the product at that x value will have a value (y-value)of zero

if f(x) or g(x)=0 ⟶ (fxg)(x)=0

Multiply by a zero? Zero!

c) if you are dividing a function with a zero, the quotient at that x value will have an asymptote.

if f(x) =0 ⟶ $\frac{g(x)}{f(x)}$=undef

Dividing by a zero? Asymptote!

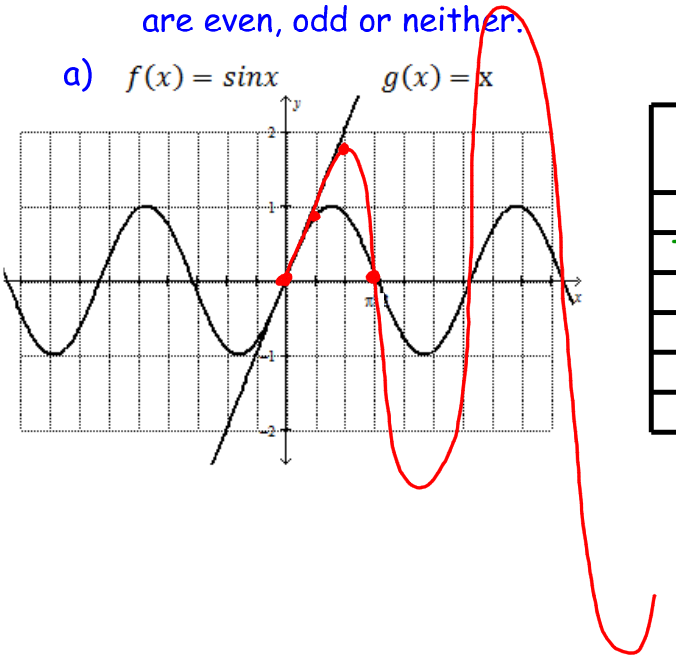
3) Points of Intersection:

a) subtraction: resultant becomes ⟶ y- value is zero.
b) addition: resultant becomes ⟶ 2 x the y-value of Point
c) multiplication becomes ⟶ y-value of point is squared
d) division: becomes ⟶ + 1

Dec 9-10:47 PM

Ex 3: For each of the following examples fill in the tables identifying the key features of the resulting function. State if original and combined functions are even, odd or neither.

a) $f(x) = sinx$ $g(x) = x$

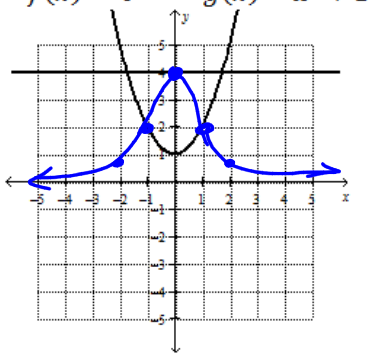


x	f	g	fg
0	0	0	0
π/3	√3/2	1	√3/2
2π/3	√3/2	2.1	1.8
π	0	3.1	0

"y" "y" → Multiply

ODD × ODD = EVEN

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

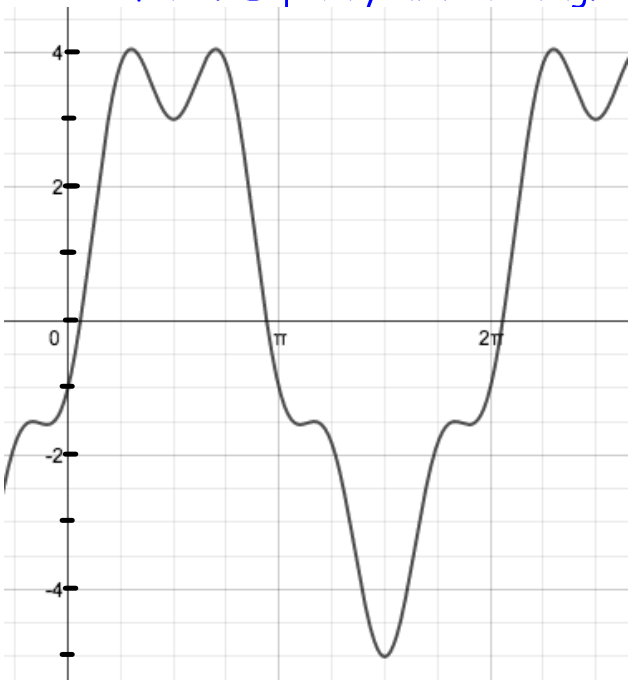


x	f	g	f÷g
-2	4	5	4/5
-1	4	2	2
0	4	1	4
1	4	2	2
2	4	5	4/5

EVEN ÷ EVEN = EVEN

Dec 9-11:27 PM

Ex 4: The following function was created by combining two familiar functions. Predict which two functions may have been combined, and how they were defined. Explain your reasoning.



Periodic: $\sin x$?

Amplitude?

$4\sin x$?

Translated down?

$4\sin x - \cos 4x$

Dec 10-7:19 PM

Homework

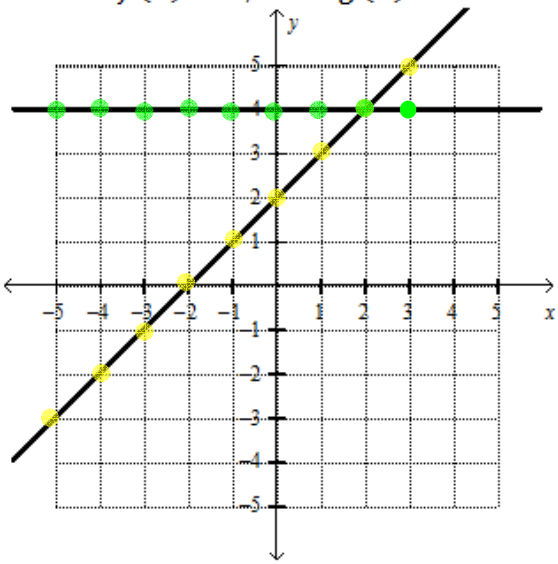
p. 528 #2,5,13

p. 537 #1bf,3,4-7f,10

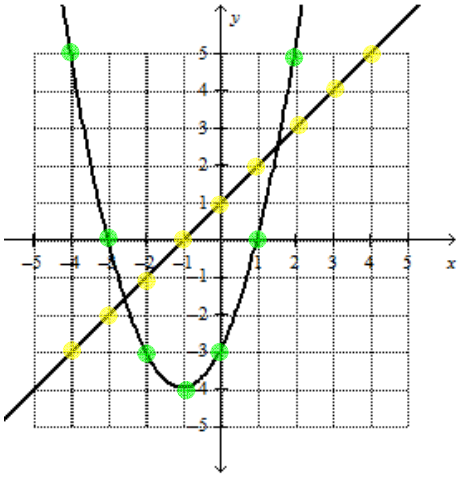
p. 542 #2 (for #1cdf)

Jan 3-7:34 PM

$f(x) = 4, \quad g(x) = x + 2$

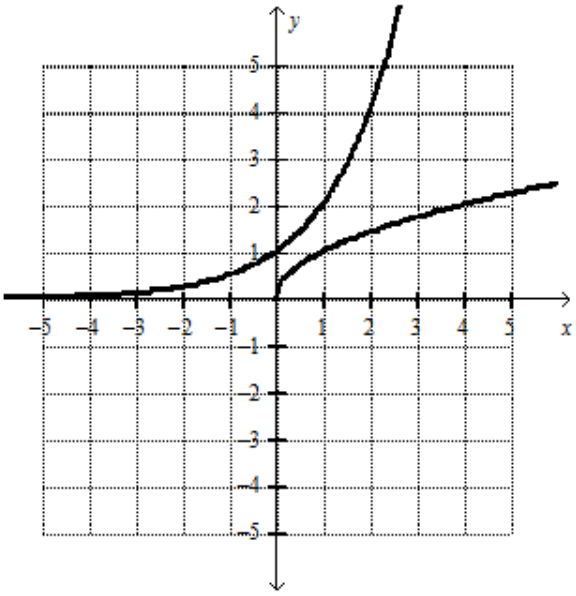


. $f(x) = x + 1 \quad g(x) = (x + 3)(x - 1)$

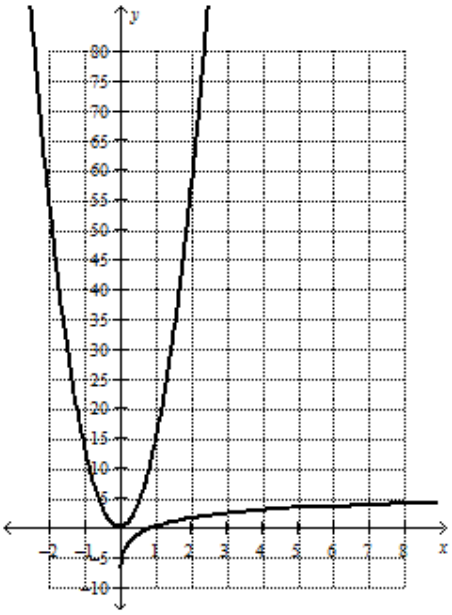


Dec 9-11:27 PM

$f(x) = 2^x \quad g(x) = \sqrt{x}$



$f(x) = 14x^2 \qquad g(x) = 2log x$



consider the coordinates:

(-1,14), (0,0), (1,14)

(1,0), (10,2)

Dec 9-11:27 PM