

Unit 7: Combinations of Functions

Sums & Differences of Functions

Jan 6/2015

Sum:

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

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

"f plus g of x"

Difference:

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

"f minus g of x"

To graph, pick an x-value and determine y-values for each function, then add or subtract the y-values.

Algebraically, combine the two functions, simplifying where possible.

Jan 5-8:11 PM

Functions can only be combined for x-values which are valid for both functions. This is where the domains of both functions overlap, which is called the intersection of the domains.

$$D_{f+g} = D_f \cap D_g$$

"intersection"

Ex.1 Given $f = \{(1,3), (2,-5), (3,7)\}$

$$g = \{(2,-2), (3,3), (4,1)\}$$

- (a) determine the domain of each function.
- (b) determine the domain of $f + g$.
- (c) determine $f + g$.

(a) $D_f = \{1, 2, 3\}$ $D_g = \{2, 3, 4\}$

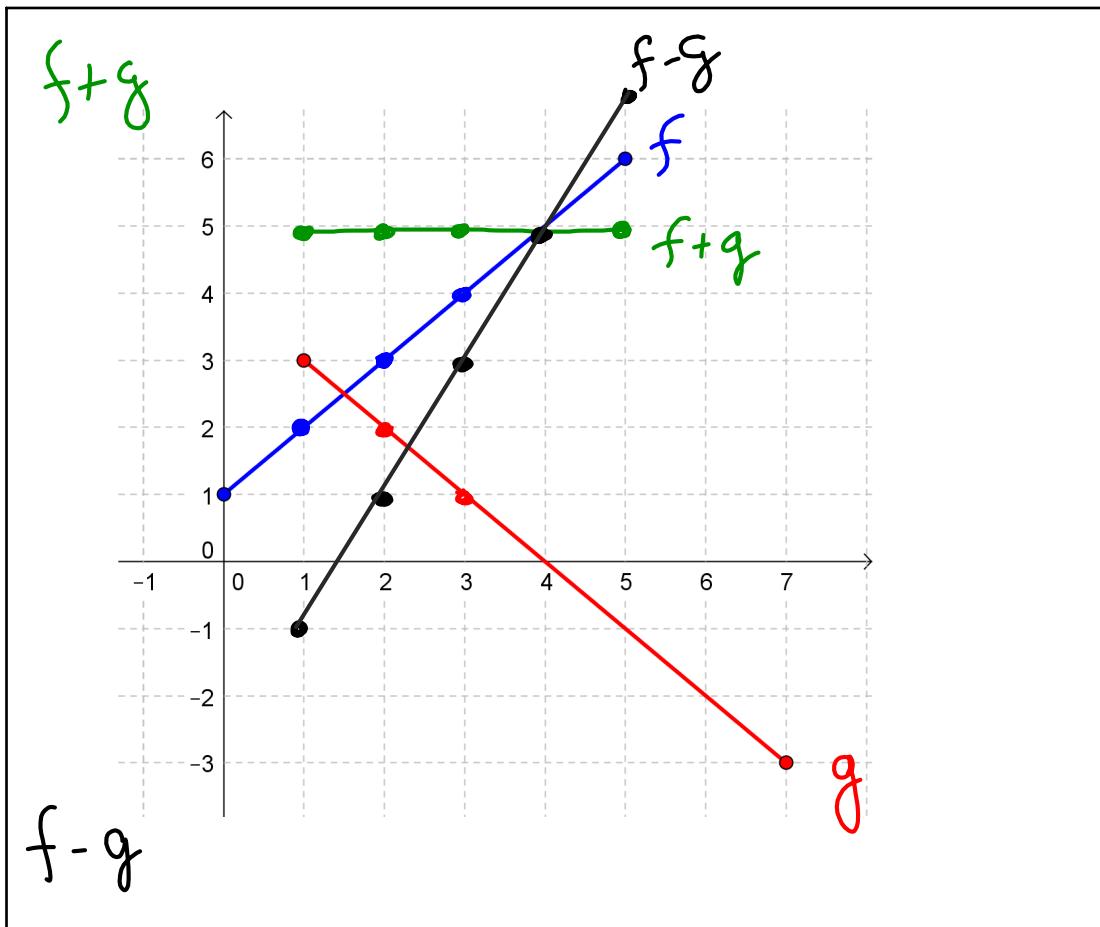
(b) $D_{f+g} = \{2, 3\}$

(c) $f+g = \{(2,-7), (3,10)\}$

x-values do not change!

add y-values for corresponding x-values

Jan 6-8:57 AM

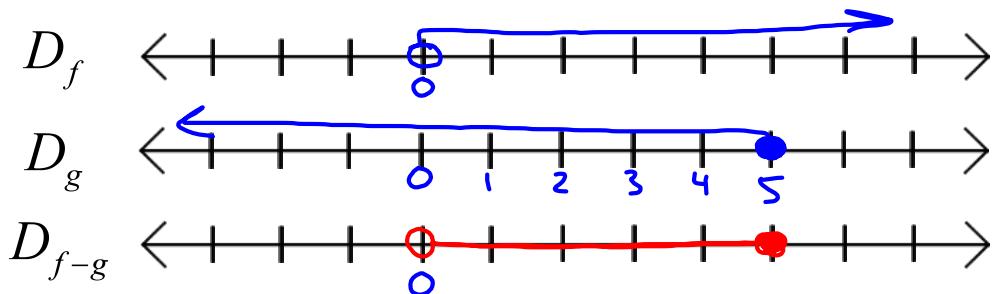


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Ex.2 Given $D_f = \{x \in \mathbb{R} \mid x > 0\}$

$$D_g = \{x \in \mathbb{R} \mid x \leq 5\}$$

- (a) represent each domain on a number line.
 (b) represent the domain of $f - g$ on the same line.



- (c) represent the domain of $f - g$ using set notation.

$$D_{f-g} = \{x \in \mathbb{R} \mid 0 < x \leq 5\}$$

Jan 6-10:45 AM

Recall:

(1) An even function has reflective symmetry with respect to the y-axis.

$$f(x) = f(-x)$$

(2) An odd function has rotational symmetry with respect to the origin.

$$f(x) = -f(-x)$$

or

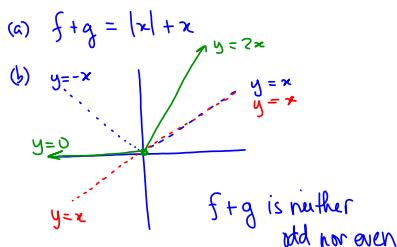
$$-f(x) = f(-x)$$

Jan 6-10:53 AM

Assigned Work:

p.528 # 1ace, 2, 3, 7, 9acef, 10, 11, 13

5. $f(x) = |x|$ $g(x) = x$
 even odd



algebraically :

even : $f(x) = f(-x)$

odd : $f(x) = -f(-x)$

or
 $-f(x) = f(-x)$

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

$h(x) = |x| + x$

even : $h(-x) = |-x| + (-x)$
 $= |x| - x \therefore$ not even

odd : $-h(x) = -(|x| + x)$
 $= -|x| - x \therefore$ not odd

Jan 6-9:35 AM

$$7(a) \quad f(x) = \frac{1}{3x+4} \quad g(x) = \frac{1}{x-2}$$

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

$$5) \quad D_{f+g} = \left\{ x \in \mathbb{R} \mid x = -\frac{4}{3}, x \neq 2 \right\}$$

Jan 7-12:42 PM

$$11. \quad P(t) = 5000 - 1000 \cos\left(\frac{\pi}{6}t\right)$$

$$(a) \quad C(t) = -25t$$

^{new}
pop: $N(t) = P(t) + C(t)$

$$= 5000 - 1000 \cos\left(\frac{\pi}{6}t\right) - 25t$$

Jan 7-12:45 PM

13. $f - g = \sqrt{2} \sin(\pi(x-2.25))$

$\overbrace{\hspace{1cm}}$
both must have same period

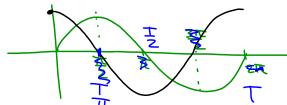
$$A - B = \sqrt{2} \quad \text{let } B = 1$$

$$A - 1 = \sqrt{2}$$

$$A = 1 + \sqrt{2}$$

$$f(x) = (1 + \sqrt{2}) \sin(\pi(x-2.25))$$

$$g(x) = (1) \sin(\pi(x-2.25))$$



$$\omega \rightarrow \frac{\pi}{T} = \sin$$

$$k = \frac{2\pi}{T}$$

$$T = \frac{2\pi}{k}$$

$$= \frac{2\pi}{\pi} \quad \sin \pi(x) = \cos \pi(x - \frac{1}{2})$$

$$T = 2$$

$$g(x) = \sin(\pi(x-2.25))$$

$$= \cos(\pi(x - \frac{1}{2} - 2.25))$$

$$= \cos(\pi(x - 2.75))$$

Jan 7-12:48 PM