Addition of Functions

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Addition of functions

We know how to add numbers. Adding functions is just as easy. When presented with two functions to add together, the idea is to group like terms. The best way to understand this is through an example.

Example

Given the functions f and g below, what is $f + g$?

$$f(x) = -6x^4 + 7 \quad , \text{ and } g(x) = 3x^2 - 7x^4 + 3$$

Solution

$$
\begin{aligned}
& f(x) + g(x) \\
=\ & (-6x^4 + 7) + (3x^2 - 7x^4 + 3) \\
=\ & -6x^4 + 7 + 3x^2 - 7x^4 + 3 \\
=\ & -6x^4 - 7x^4 + 3x^2 + 7 + 3 \\
=\ & -13x^4 + 3x^2 + 10
\end{aligned}
$$

Subtraction of functions is the same as subtraction of number, grouping like terms. Let's consider an example.

Example

Given the functions f and g below, what is $f - g$?

$$f(x) = -6x^4 + 7 \quad , \text{ and } g(x) = 3x^2 - 7x^4 + 3$$

Solution

$$
\begin{aligned}
& f(x) - g(x) \\
=\ & (-6x^4 + 7) - (3x^2 - 7x^4 + 3) \\
=\ & -6x^4 + 7 - 3x^2 + 7x^4 - 3 \\
=\ & -6x^4 + 7x^4 - 3x^2 + 7 - 3 \\
=\ & x^4 - 3x^2 + 4
\end{aligned}
$$

Exercises

1. For the following functions f and g find $f + g$ and $f - g$.

   (a) (1 point) $f(x) = x^2 + 3, \ g(x) = x - 2x^2 + 1$

   (b) (1 point) $f(x) - x^3 + x + 5, \ g(x) = x - 3x^3$

   (c) (1 point) $f(x)\frac{1}{x+1} + 2, \ g(x) = \frac{3}{2x+2}$
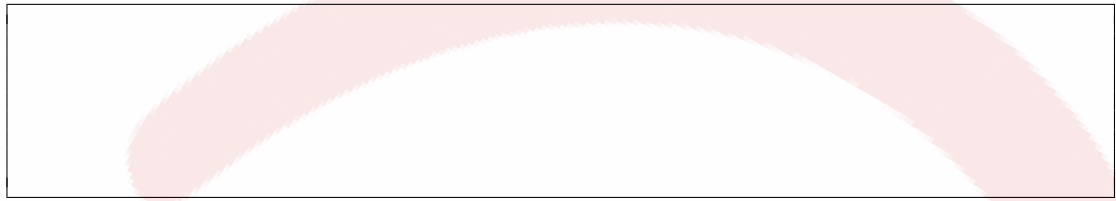

   (d) (1 point) $f(x) = 4x^5 - 2x^3 + x, \ g(x) = -2x^4 + x^2 - 6$

(e) (1 point) $f(\theta) = \sin^2 \theta + \cos \theta, \ g(\theta) = \cos^2 \theta + 2\sin^2 \theta$

(f) (1 point) $f(t) = 2 - t^2 + 3t^3, \ g(t) = -t^4 + 2t^3 + t^2 - 1$

(g) (1 point) $f(x) = x - 1, \ g(x) = x^2 + x - 1$

(h) (1 point) $f(t) = e^t + 2t - 3, \; g(t) = 3e^t - t + 1$

(i) (1 point) $f(x) = (x - 1)^2 + 2, \; g(x) = 2x^2 + 7$

(j) (1 point) $f(x) = 3\sin x + 2\sin^2 x - \sin^3 x, \; g(x) = -5\sin^2 x + \sin x - 2\sin^3 x + 3\sin^4 x$