

Function Composition

When you substitute one function into another, that is called composition.

Example: $f(g(x))$

To evaluate, substitute the inner function into the variables of the outer function.

Given $f(x) = 4x^2 + 2$ and $g(x) = \sqrt{2x}$

Evaluate: $g(f(x))$

$$g(x) = \sqrt{2x}$$

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

Sub. $(4x^2 - 2)$ in for x .

$$g(f(x)) = \sqrt{8x^2 - 4}$$

Simplify.

Evaluate: $f(g(x))$

$$f(x) = 4x^2 + 2$$

$$f(g(x)) = 4(\sqrt{2x})^2 + 2$$

Sub. $(\sqrt{2x})$ in for x .

$$f(g(x)) = 4(2x) + 2$$

Simplify.

$$f(g(x)) = 8x + 2$$

Given $f(x) = x^2$. Write the equation for the following transformations.

$$y = f(4x)$$

$$y = (4x)^2 \quad \text{Sub. } 4x \text{ into } f(x)$$

$$y = (4x)^2$$

$$y = f(2x) + 5$$

$$y = (2x)^2 \quad \text{Sub. } 2x \text{ into } f(x)$$

$$y = (2x)^2 + 5 \quad \text{Add } 5$$

$$y = -2f(x - 1)$$

$$y = (x - 1)^2 \quad \text{Sub. } x-1 \text{ into } f(x)$$

$$y = -2(x - 1)^2 \quad \text{Mult. By } -2$$

$$y = 6f(x) + 3$$

$$y = 6x^2 \quad \text{Mult. } f(x) \text{ by } 6$$

$$y = 6x^2 + 3 \quad \text{Add } 3$$