

Pre-Calc Unit Lesson #5: Operations on functions

1. If $f(x) = \sqrt{x} + 1$, $g(x) = \sqrt{x}$, $j(x) = x^2 + 2$, and $i(x) = 4x - 3$, then find:

A. $(f \bullet g)(4)$

$f(4) \bullet g(4)$

$3 \bullet 2$

6

B. $(f \bullet g)(x)$

$f(x) \bullet g(x)$

$(\sqrt{x} + 1) \bullet \sqrt{x}$

$x + \sqrt{x}$

C. $(f \circ g)(x)$

$f(g(x))$

$f(\sqrt{x})$

$\sqrt{\sqrt{x} + 1}$ or $\sqrt[4]{x+1}$

D. $j(i(x))$

$j(4x - 3)$

$(4x - 3)^2 + 2$

$16x^2 - 24x + 11$

E. $i(i(x))$

$i(4x - 3)$

$4(4x - 3) - 3$

$16x - 15$

F. $j(j(x))$

$j(x^2 + 2)$

$(x^2 + 2)^2 + 2$

$x^4 + 4x^2 + 6$

G. $(j - i)(x)$

$x^2 + 2 - (4x - 3)$

$x^2 - 4x + 5$

H. $\frac{f}{g}(x)$

$\frac{\sqrt{x} + 1}{\sqrt{x}}$ or $1 + \frac{1}{\sqrt{x}}$

I. $j(i(g(4)))$

$j(i(2)) = j(5) =$ 27

J. $\frac{i(x+h) - i(x)}{h}$ Note: $i(x+h) = 4(x+h) - 3$

$$\frac{4(x+h) - 3 - (4x - 3)}{h} = \frac{4x + 4h - 3 - 4x + 3}{h} = \frac{4h}{h} = \underline{4}$$

K. $\frac{j(x+h) - j(x)}{h}$

$$\frac{(x+h)^2 + 2(x+h) + 1 - (x^2 + 2x + 1)}{h} =$$

$$\frac{x^2 + 2xh + h^2 + 2x + 2h + 1 - x^2 - 2x - 1}{h} =$$

$$\frac{2xh + h^2 + 2h}{h} =$$

$$\frac{h(2x + h + 1)}{h} = \underline{2x + h + 1}$$

2. Try to find $\frac{f(x+h) - f(x)}{h}$ (called the difference quotient)
for $f(x) = x^2 + 2x + 1$.

$$\underline{2x + h + 2}$$

3. If $f(x) = \frac{1}{x-2}$ and $g(x) = \frac{2}{x+3}$, then find the following:

A. $(f - g)(x)$

B. $f(g(x))$

$$\frac{1}{x-2} - \frac{2}{x+3} \quad \text{Find common den.}$$

$$f\left(\frac{2}{x+3}\right) \quad \text{Plug in } g(x)$$

$$\frac{x+3-2(x-2)}{(x-2)(x+3)} \quad \text{Simplify}$$

$$\frac{1}{\frac{2}{x+3} - 2}$$

Multiply top and bottom by $x+3$

$$\boxed{\frac{-x+7}{(x-2)(x+3)}}$$

$$\frac{1(x+3)}{2-2(x+3)} = \boxed{\frac{x+3}{-2x-4}}$$

Homework: Ditto Operations on Functions (Calculus)