Alg II Notes

Composite Functions

The notation $f(x)$ [say "f of x"] means a function of the number x.

If $f(x)=2x^2-3x-5$, find $f(1)$. Substitute 1 in for x ➔ $f(1)=2\cdot1^2-3\cdot1-5$, so $f(1)=-6$.

ex 1 - If $f(x)=-4x^3+3x-7$, find $f(2)$.

$f(2) = -4(2)^3 + 3(2) - 7$

$= -4(8) + 6 - 7$

$= -32 + 6 - 7 = -26 - 7 = \boxed{-33}$

$\boxed{f(2) = -33}$

Composite functions are functions of other functions. Several notations for composite functions are these: $f(g(x))$, $f[g(x)]$, and $f \circ g$. For all, you say "f of g of x."

ex 2 If $f(x)=2x+5$ and $g(x)=3-4x$, then find:

a. $f(g(1)) = 3$

$g(1) = 3-4(1) = 3-4 = -1$

$f(-1) = 2(-1)+5$

$= -2+5$

$= 3$

b. $g(f(-2)) = -1$

$f(-2) = 2(-2)+5 = -4+5 = 1$

$g(1) = 3-4(1) = 3-4 = -1$

ex 3 If $f(x)=x^2$, $g(x)=x+5$, and $h(x)=\sqrt{10-x}$, then what is $f(g(h(1)))$? $= 64$

$h(1) = \sqrt{10-1} = \sqrt{9} = 3$

$g(3) = 3+5 = 8$

$f(8) = 8^2 = 64$

Try a check value: $f(g(1))$

$g(1) = 3$

$f(3) = 12$

ex 4 If $f(x)=x^2+x$ and $g(x)=1+2x$, then what is $f[g(x)]$?

$g(x)$ becomes the input for f

$f(1+2x) = (1+2x)^2 + (1+2x) = (1+2x)(1+2x) + (1+2x)$

$= 1+4x+4x^2+1+2x$

$= \boxed{4x^2+6x+2}$

$f(g(1)) = 4+6+2 = 12$

ex 5 If $f(x)=x^2+x$ and $g(x)=1+2x$, then what is $g[f(x)]$?

$g(x^2+x) = 1+2(x^2+x) = \boxed{2x^2+2x+1}$

Notice $f \circ g$ is NOT necessarily equal to $g \circ f$

ex 6 If $f(x)=\sqrt{x}$ and $g(x)=x+5$, then find:

a. $f \circ g$

$f(x+5) = \sqrt{x+5}$

b. $g \circ f$

$g(\sqrt{x}) = \boxed{\sqrt{x}+5}$