p. 520

8-7: Composition of Functions

On a vacation to Europe you need to convert your U.S. American Dollars to Irish punts.

However, we only know that the formula to convert British pounds to Irish punts

$$B(x) = 0.9733x$$

American Dollars to British pounds

$$A(x) = 0.6252x$$

How do we find a direct equation to convert American Dollars to Irish punts?

$$B[A(x)] = 0.9733x$$

$0.6252x$

$$B[A(x)] = 0.9733(0.6252x)$$

$$B[A(x)] = .6085x$$

This converts American to Irish

$\$500 \rightarrow 304.25$ Irish Punts

Basically, plugging one function into another is called a Composition of functions.

Example: If $f(x) = x^2 - 4$ and $g(x) = 4x - 1$

find $[f \circ g](x)$.

This is read as "F of g of x."

also written as $F[g(x)]$

$$x^2 - 4$$

$$\downarrow$$

$$(4x-1)^2 - 4$$

$$(4x-1)(4x-1) - 4$$

$$16x^2 - 8x + 1 - 4$$

$$F[g(x)] = 16x^2 - 8x - 3$$

Find $[g \circ F](x) = G[F(x)]$

$$G = 4x - 1$$

$$\downarrow$$

$$= 4(x^2 - 4) - 1$$

Plug in $F(x)$

$$4x^2 - 16 - 1$$

$$G[F(x)] = 4x^2 - 17$$

Example $f(x) = x + 5$ $g(x) = x^2 - 2$

Find $[f \circ g](3) \rightarrow F[g(3)]$

$x + 5$

$\downarrow$

$(x^2 - 2) + 5$

$3^2 - 2 + 5$

$9 - 2 + 5 = \boxed{12}$ yahoo!

Find $G[f(3)]$

$G = x^2 - 2$

$G[f(3)] = (x+5)^2 - 2$

$= (3+5)^2 - 2$

$= 8^2 - 2$

$= 64 - 2 = \boxed{62}$

Assignment:

$F(x) = x + 6$ $\quad$ $G(x) = x - 3$

$F[G(2)]$ & $G[f(2)]$

$x + 6$ $\quad$ $x - 3$

$(x - 3) + 6$ $\quad$ $(x + 6) - 3$

$2 - 3 + 6$ $\quad$ $(2 + 6) - 3$

(5) $\quad$ (5)