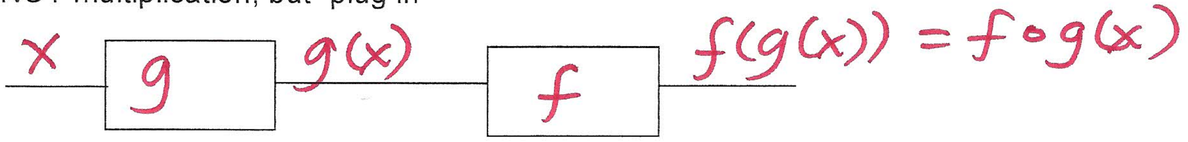
12.1 Composite and Inverse Functions

Composite Function Notation: $f \circ g(x) = f(g(x))$
NOT multiplication, but "plug in"



Ex a **For $f(x) = x^2 + x$ and $g(x) = 4 - x$, find**

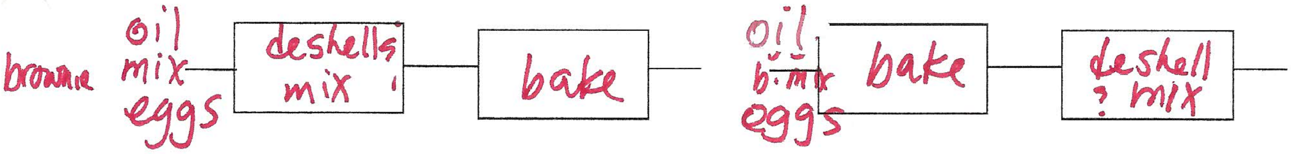
1) $f \circ g(x)$ $= f(g(x)) = \boxed{4-x}^2 + \boxed{4-x}$

$= 16 - 8x + x^2 + 4 - x = x^2 - 9x + 20$

2) $g \circ f(x)$ $= g(f(x)) = 4 - \boxed{x^2+x}$

$= 4 - x^2 - x = -x^2 - x + 4$

Note: Composition is not necessarily commutative (order matters!)



We can plug specific values into composite functions – easier than performing the composition of the entire functions:

Ex b For $f(x) = \sqrt{x+3}$ and $g(x) = \dfrac{4}{5 - x^2}$ find

1) $f \circ g(-1)$ $= f\boxed{g(-1)}$

$\boxed{g(-1)} = \dfrac{4}{5-(-1)^2} = \dfrac{4}{5-1} = \boxed{1}$ $\quad f\boxed{g(-1)} = f\boxed{1}$

$= \sqrt{1+3} = 2$

2) $g \circ f(3)$ $= g(f(3))$

$f(3) = \sqrt{3+3} = \sqrt{6}$

$g(f(3)) = \dfrac{4}{5-(\sqrt{6})^2} = \dfrac{4}{5-6} = \dfrac{4}{-1} = -4$