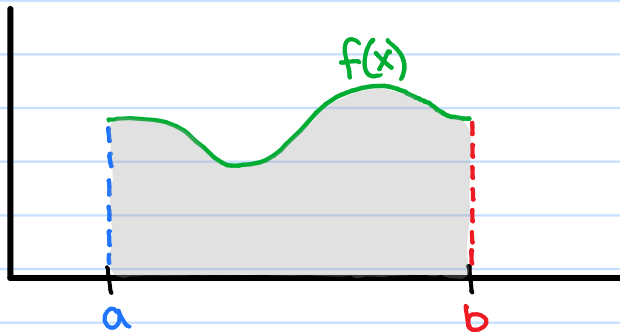# Learning Goal 7.2 Study Guide
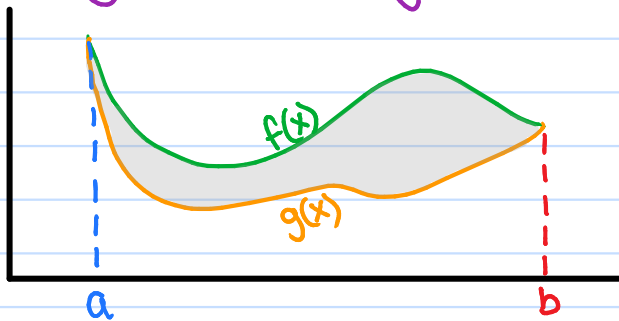
The goal: Use integrals to find area of a region in the xy-plane.

Setting up an integral with x-axis as a boundary:

$$\int_a^b f(x)\, dx$$

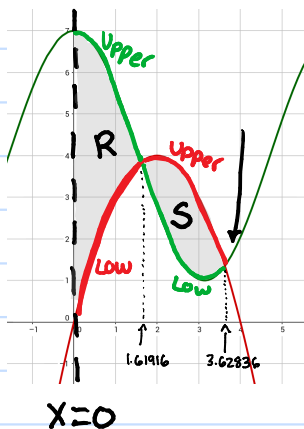## Setting up an integral to represent area between curves:

$$\int_a^b \underbrace{f(x)}_{Upper} - \underbrace{g(x)}_{Lower}\, dx$$

Important questions to ask:
→ Which is the "upper" function and "lower" function?
→ If a and b are not stated, where do the functions meet?
→ Do I need multiple integrals?

Example: Write an integral or integrals to represent the area enclosed by $x=0$, $y=3\cos x$ and $y=-(x-2)^2+4$

The line $x=0$ is a vertical line. The graphs meet twice at $x=1.61916$ and $x=3.62836$ (found with a calculator)

Therefore, the area can be expressed with 2 integrals:

$$\underbrace{\int_0^{1.61916} \underbrace{(3\cos x)}_{Upper} - \underbrace{(-(x-2)^2+4)}_{Lower}\, dx}_{R} + \underbrace{\int_{1.61916}^{3.62836} \underbrace{(-(x-2)^2+4)}_{Upper} - \underbrace{(3\cos x)}_{Lower}\, dx}_{S}$$