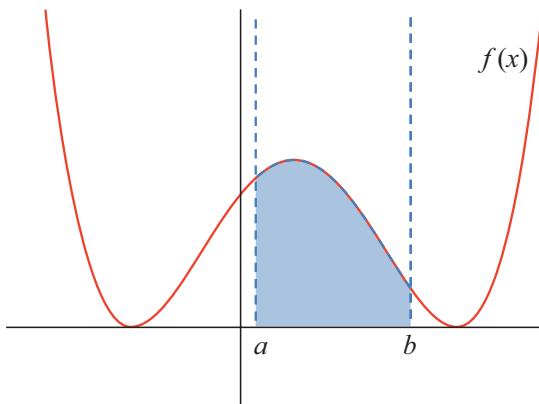


The Next Big Idea of AP Calculus: The Definite Integral

In AP Calculus, we will explore the idea of the accumulation of area under the curve. In fact, the next several months will be spent studying and applying a technique called *integration*. Let's begin by learning the symbolic expression associated with integration.



Graph created using Desmos.com

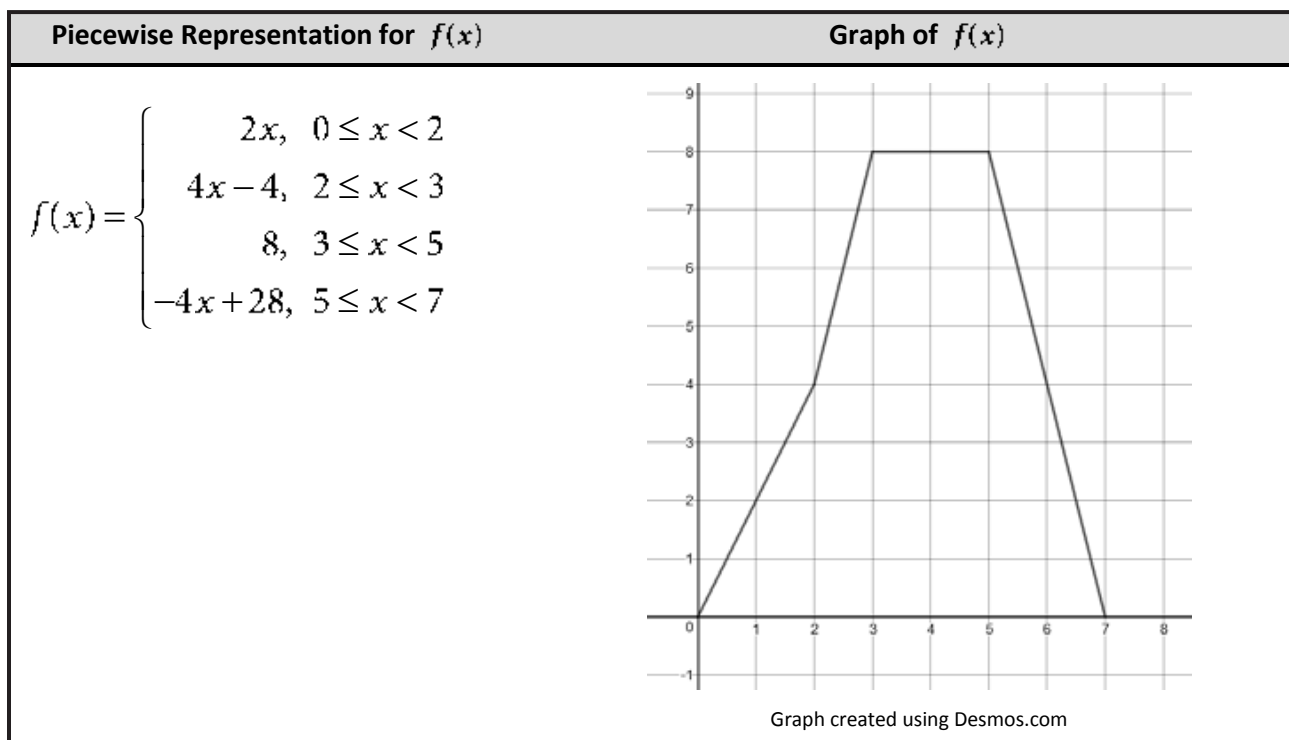
Introducing the Definite Integral

The notation $\int_a^b f(x) dx$ is read as:

and can be used to determine

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

Model Problem and Practice



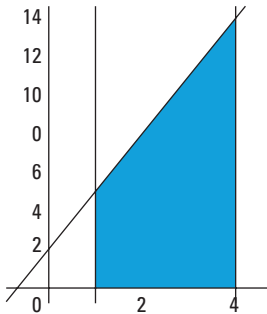
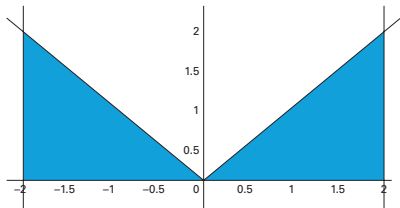
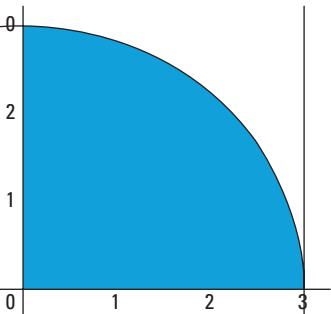
For each of the definite integrals shown below, first read the notation out loud to your partner, then explain the meaning of the definite integral. Finally, using your knowledge of geometry, determine the exact value of the definite integral.

<p>(a) Example</p> $\int_0^3 f(x) dx$	<p>(b) $\int_3^5 f(x) dx$</p>
<p>(c) $\int_1^7 f(x) dx$</p>	<p>(d) $\int_3^0 f(x) dx$</p>

Challenge Question: There is a value k such that the $\int_0^k f(x) dx = 22$. Find the value of k . Show the work which supports your answer.

Partner Practice

For this next set of problems, evaluate the definite integral. Be sure to show your work.

<p>Example 1</p> $\int_1^4 (3x+2)dx$	<p>Example 2</p> $\int_{-2}^2 x dx$	<p>Example 3</p> $\int_0^3 \sqrt{9-x^2} dx$
		

Challenge Question

Create an integral expression which can be used to determine the area in the first quadrant which is bounded by the graph of $f(x) = 1 - x^2$.

