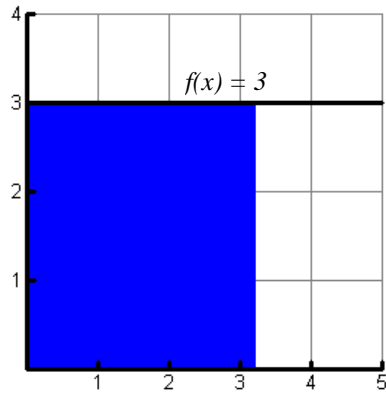


## Area, Antiderivatives & Integrals (4.2)

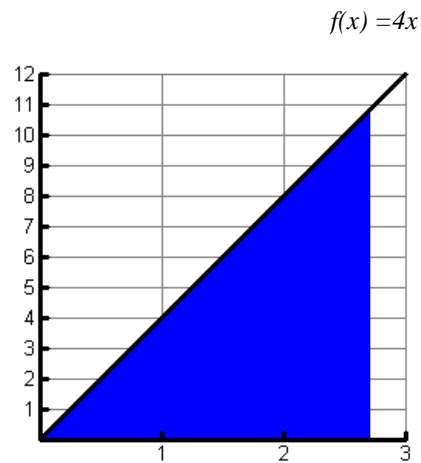
Consider the problem of finding the area under a curve. Let the area function be represented by  $A(x)$ .



1. Find  $A(x)$

2. Find  $A(1)$ ,  $A(2)$ , and  $A(7)$

3. How are  $f(x)$  and  $A(x)$  related?



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Consider the function  $f(x) = 8$ . List some functions that have  $f(x) = 8$  as their derivative. Call these functions  $F$  or  $F(x)$ .

How many are there? \_\_\_\_\_

Theorem 1: If two functions  $F$  and  $G$  have the same derivative over an interval, then  

$$F(x) = G(x) + C$$
, where  $C$  is a constant.

• **Indefinite Integrals & Antiderivatives**

The reverse of differentiating is *antidifferentiating*, and the result of antidifferentiating is called the \_\_\_\_\_. The process of antidifferentiating is called \_\_\_\_\_.

$$\int f(x)dx = F(x) + C$$

$F(x) + C$  is the general form of the antiderivative of  $f(x)$  since  $\frac{d}{dx}[F(x) + C] = f(x)$ .

So, for example  $\int 8dx =$  \_\_\_\_\_ since  $\frac{d}{dx}[\text{_____}] = 8$

**Examples:**

1. Which of the following is  $\int 4x^3 dx$ ?

- a.  $12x^2 + C$                       b.  $x^4 + C$

2. Which of the following is  $\int 2xe^{x^2} dx$ ?

- a.  $e^{x^2} + C$                       b.  $x^2 \cdot \frac{e^{x^2}}{2} + C$

3. Which of the following is  $\int \left(\frac{1}{x} + 2\right) dx$ ?

- a.  $\ln(xe^{2x}) + C$                       b.  $-\frac{x^{-2}}{2} + 2x + C$