

Name: \_\_\_\_\_

## 6.4 Fundamental Theorem of Calculus

Warm-up: Evaluate the following:

1.  $\int (3 \sin x + \cos x) dx$

2.  $\int_{-1}^3 |x| dx$

3.  $\int_{-2}^{-1} \frac{x^2 + 3}{x} dx$

Fundamental Theorem of Calculus:

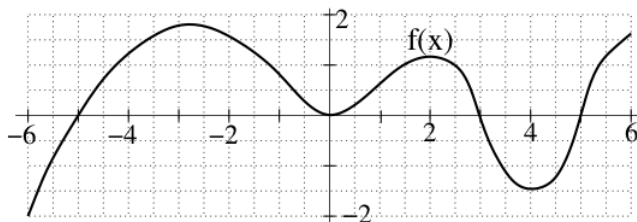
Let  $F'(x) = f(x)$ , so  $F$  is an antiderivative of  $f$ . Then

1.  $\int_a^b f(x) dx =$

2.  $F(x) =$

1. Find  $F'(x)$  where  $F(x) = \int_2^{3x} (2 \cos(t)) dt$

2. Let  $F(x) = \int_0^x f(t) dt$ , where  $f(x)$  is the function whose graph is given below.



- What are the critical points of  $F(x)$ ?
  - Where is  $F(x)$  increasing? decreasing?
  - Locate all places where  $F(x)$  has a local maximum or a local minimum, and make it clear which are which.
  - Where is  $F(x)$  concave up? concave down?
  - Where does  $F$  attain its maximum value? Use a method of your choice to estimate this maximum value.
3. Let  $F(x) = \int_2^x \frac{1}{\ln t} dt$  for  $x \geq 2$ .
- Find  $F'(x)$ .
  - Is  $F$  increasing or decreasing? What can you say about the concavity of  $F$ ?

4. Let  $f(x)$  be the function whose graph is given to the right. Define

$$F(x) = \int_0^x f(t) dt.$$

Fill in the entries in the table that follow:

$x$	1	2	3	4	5
$F(x)$					
$F'(x)$					
$F''(x)$					

