

# Math 1a. §5.4 Worksheet

## The Fundamental Theorem of Calculus

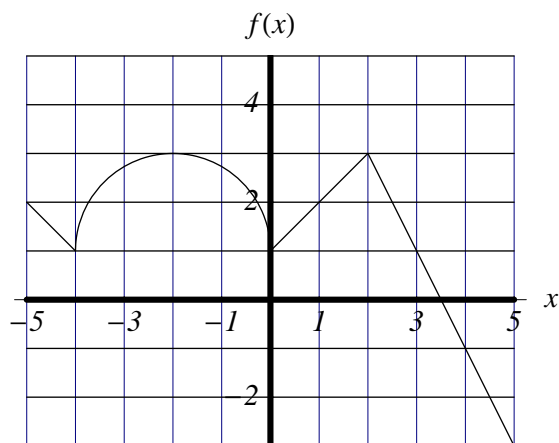
Fall 2005

1. Let  $f(t)$  be the function defined on the interval  $[-5, 5]$  by the graph below, and define the area function  $F$  by

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

Answer the following questions.

- (a) Where is  $F$  increasing and decreasing?
- (b) Where is the absolute maximum and the absolute minimum of  $F$ ?
- (c) Where are the local extreme points?
- (d) Where is  $F$  concave up and concave down?
- (e) Where are the inflection points of  $F$ ?



2. (a) Find the derivative of

$$\int_0^x \frac{1}{1+t^2} dt,$$

where  $x \neq 0$ .

(b) Find the derivative of

$$\int_0^{1/x} \frac{1}{1+t^2} dt,$$

where  $x \neq 0$ .

(c) Find the derivative of

$$F(x) = \int_0^x \frac{1}{1+t^2} dt + \int_0^{1/x} \frac{1}{1+t^2} dt,$$

where  $x \neq 0$ . Conclude that  $F(x)$  is constant on  $(-\infty, 0)$  and constant on  $(0, \infty)$ .

(d) Evaluate the constant value(s) of  $F(x)$ .