

## Section 5.3: Evaluating Definite Integrals

These notes reflect material from our text, *Calculus, Concepts and Contexts, Third Edition*, by James Stewart, published by Brooks/Cole, Pacific Grove, CA, 2005.

*Key points from Stewart, Section 5.3: Evaluating definite integrals.  
The definite integral of a derivative represents total change.*

### Concepts

**Evaluation Theorem.** If  $f$  is continuous on the interval  $[a, b]$ , and  $F' = f$ , then

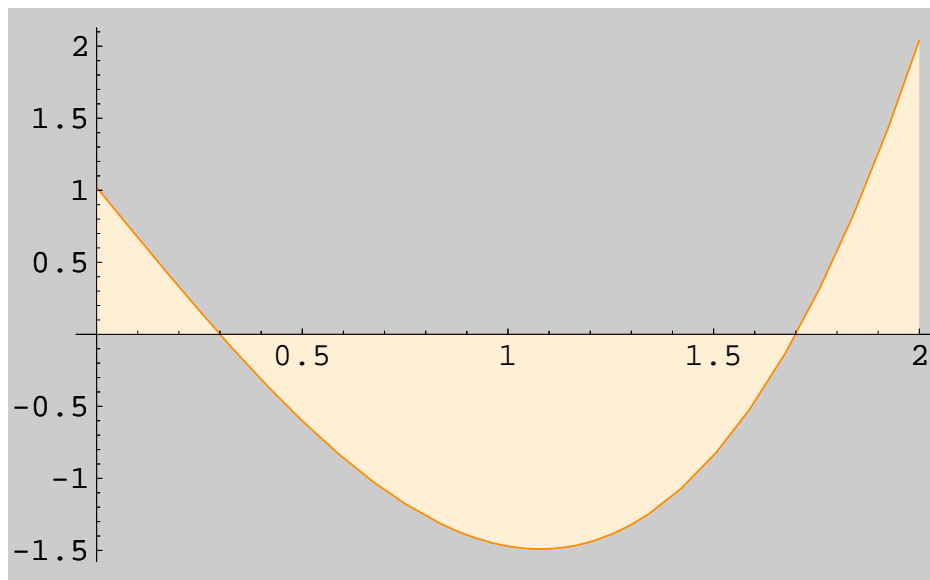
$$\int_a^b f(x) dx = F(b) - F(a).$$

Proof of the Evaluation Theorem from the Mean Value Theorem.

Indefinite integrals.

**Total Change Theorem.** The integral of a rate of change is the total change,

$$\int_a^b F'(x) dx = F(b) - F(a).$$



*Fig. Signed area.*

### Exercises

*Exercises for Section 5.3, pp 374–376:* 7, 13, 15, 17, 19, 23, 27 (evaluating definite integrals), 31, 35, 39, 45, 49 (oil leak), 50 (bees), 55 (velocity), 62 (volcano), 65 (Lorenz curve), 66 (Endeavour)