

## Section 6.1: Antiderivatives

### Section Objectives:

- Know the definition of an antiderivative and what it means to be a general antiderivative.
- Know the symbol for indefinite integrals and that this is the same as the general antiderivative.
- Know the antiderivative rules listed below.

$$1. \int kf(x) dx = k \int f(x) dx$$

$$2. \int (f(x) \pm g(x)) dx = \int f(x) dx \pm \int g(x) dx$$

$$3. \int x^n dx = \frac{x^{n+1}}{n+1} + C \quad n \neq -1$$

$$4. \int e^x dx = e^x + C$$

$$5. \int \frac{1}{x} dx = \ln|x| + C$$

- Use antiderivatives to find cost and revenue functions from marginal cost and revenue (and other similar examples).

### Practice Problems

1. Evaluate the following antiderivatives. Check your work by taking the derivatives of the functions you get.

$$(a) \int 3x^2 + 2x dx$$

$$(b) \int \sqrt{x} + \frac{1}{x^2} dx$$

$$(c) \int \frac{1}{x} + 3e^x dx$$

$$(d) \int \frac{t^4 + 4}{t^2} dt$$

$$(e) \int \left(x + \frac{1}{x}\right)(x + 3) dx$$

2. Is  $F(x) = \ln(2x^2 + 1) + C$  an antiderivative of  $f(x) = \frac{1}{2x^2 + 1}$ ? Why or why not?

3. Kyle finds that for his designer coffee bean business the marginal revenue is  $30 - 2x$  where  $x$  is in bags of beans produced and sold. Find his revenue function. How much should he produce to maximize revenue?

4. Mia is selling handmade watches. The marginal cost function for a watch is given by  $150 - 1/2e^x$ . The fixed costs are \$300. What is the cost function?

**More Practice from Textbook 6.1:** You should do as many problems from each set (1-38, 39-55, 56-57), as needed until you are comfortable with these techniques. 39-55 are good practice for application problems.