

Math 102 — More integral basics

Problem 1. Consider the function $f(x) = 3x^2 - 3$ whose plot is shown below.

a. Use the Fundamental Theorem of Calculus and integral properties to compute:

1. $\int_0^1 f(x) dx$
2. $\int_0^3 f(x) dx$
3. $\int_1^3 f(x) dx$

b. Use symmetry, the plot below, and integral properties to find:

1. $\int_{-1}^1 f(x) dx$
2. $\int_{-3}^3 f(x) dx$
3. $\int_{-1}^{-3} f(x) dx$
4. the *signed* area of the shaded region in the plot
5. the area of the shaded region in the plot

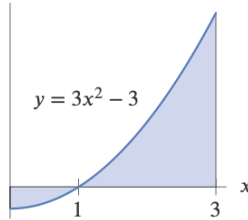


Figure 6.25

Problem 2. Consider the region between $y = e^x$ and $y = -x^2$ for values of x between 0 and 1.

- a. Sketch a picture of the region and label each curve.
- b. Find the area of the region.

Problem 3. Consider the region bounded the curves $y = x^2$ and $y = 8 - x^2$.

- a. Where do these two curves intersect?
- b. Sketch a picture of the region and label each curve.
- c. Find the area of the region.

Problem 4. Find the following indefinite integrals.

- a. $\int (4e^x - 3 \sin x) dx$
- b. $\int \left(\frac{3}{t} - \frac{2}{t^2} \right) dt$
- c. $\int (x + 3)^2 dx$
- d. $\int t^3(t^2 + 1) dt$