

# Math 102, Fall 2022 — Homework 4

Tim Chumley

Due October 14 at 5:00 pm

**Instructions.** This problem set has material mostly from Week 4 of class.

**Problem 1.** Find the following indefinite integrals by first doing some simplifying algebra.

a.  $\int x^3(x^2 + 1) dx$

b.  $\int \left( \sqrt{x^3} - \frac{2}{x} \right) dx$

c.  $\int \left( \frac{x+1}{x} \right) dx$

**Problem 2.** Find the general antiderivative of each of the following functions. Note this is asking for the same thing as the previous problem, just with different terminology.

a.  $f(x) = 4x - \frac{1}{\sqrt{x}} + 9x^{3.5}$

b.  $f(x) = 3x^3 - 4e^x + 8$

c.  $f(x) = 7 \sin x - 4 \cos x$

**Problem 3.** Find the following definite integrals. To make things easier for the graders, give both an exact final answer like  $\ln 3 + e^3$  and a decimal final answer (to 4 decimal places) like  $\ln 3 + e^3 \approx 21.1842$ .

a.  $\int_0^3 (x^2 + 3x^{0.2} - 4) dx$

b.  $\int_0^2 3e^x dx$

c.  $\int_0^1 (\sin \theta + \cos \theta) d\theta$

**Problem 4.** Find the following areas using definite integrals.

a. The area between the curves  $y = 5e^x$ ,  $y = x$ ,  $x = 0$ , and  $x = 3$ .

b. The bounded area between the curves  $y = x^2$  and  $y = 2 - x^2$ .

c. The bounded region between the  $x$ -axis and the graph of  $y = x^3 - x$ .

**Problem 5.** Suppose

$$\int_0^2 f(x) dx = 5, \int_0^3 f(x) dx = 7, \int_0^2 g(x) dx = -3, \int_0^3 g(x) dx = 5.$$

Using this information and algebraic properties of the integral, compute the following definite integrals.

- a.  $\int_0^2 [f(x) + g(x)] dx$
- b.  $\int_0^3 [f(x) - g(x)] dx$
- c.  $\int_2^3 [3f(x) + 2g(x)] dx$