Homework assignment 1, due Friday, April 14th

Complete the reading, all assigned book problems, and supplemental problems A–C.

**Reading**

Read sections 5.1–5.4. The book’s exposition is pretty good—and the diagrams can help you understand things, particularly if you feel a bit lost.

One word of caution about the textbook: Some examples in this chapter use calculators or computers to compute the values of definite integrals. You will never need a calculator or computer to complete any problems in Math 20, and any such devices are in fact prohibited on exams. While reading examples in this chapter that use calculators, just accept that the book got the answer somehow, and don’t worry too much about how; it’s usually not important to the conceptual substance of the example.

**Book Problems**

- **Section 5.1**: 2, 6
- **Section 5.2**: 2, 32
- **Section 5.3**: 2, 4, 6, 10, 12, 18(b)(ii), 20
- **Section 5.4**: 24, 46

**Supplemental Problem A**

Carefully take the derivative of the function

\[ F(x) = \arcsin x + x\sqrt{1 - x^2}. \]

You should get \[ F'(x) = 2\sqrt{1 - x^2}. \] Justify each step in your evaluation. Hint next page.

This may take you a few tries! Calculus is tricky. Just take it easy and make sure you’re using the product and chain rules correctly. You are free to use the derivative formula

\[ (\arcsin x)' = \frac{1}{\sqrt{1 - x^2}} \]

without further justification.

\(^1\) \arcsin x is a different (better) way of writing the inverse sine function. In this course arcsin, arccos, arctan are VERY MUCH preferred over the somewhat ambiguous alternatives \(\sin^{-1}, \cos^{-1}, \tan^{-1}\).
Supplemental Problem B

Carefully take the derivative of the function

\[ F(x) = \ln \left( \frac{x - 1}{x + 1} \right). \]

You should get \( F'(x) = \frac{2}{x^2 - 1} \). Justify each step in your evaluation.

Again: same deal as above. This might take a few tries. Make sure you’re using your derivative and log rules correctly. Remember that \( (\ln x)' = 1/x \).

Supplemental Problem C

A slightly unpleasant feature of integral calculus is that there’s a lot of algebra you may have forgotten that we suddenly need again. One of the most useful algebraic tricks in Math 20 is completing the square.

Complete the square for the following quadratic polynomials. That is, find constants \( a, h, k \) such that the given quadratic is equal to \( a(x + h)^2 + k \).

a. \( x^2 - 2x - 5 \)
b. \( 4x^2 + 4x \)
c. \( x^2 - x + 7 \)
d. \( 5x^2 - 4 \)
e. \( 3x^2 + 3x - 5 \)

Note: If you don’t know or don’t remember how to complete the square, I will be posting instructions for how to enroll in an online precalculus course on the Piazza site. It has, among other things, a unit on completing the square.