Lab 2: More review of current integration techniques

Names:

Goal

The goal of this lab is to review most of our current integration techniques. Many of the integrals that you are supposed to work on look similar. However, most of them have different solutions. In some cases, there is more than one technique that can be applied to discover a solution.

Directions

In groups of 2–4, answer each of the following questions in the space provided. You only need to turn in one lab per group (make sure you put everyone's name on this sheet). The lab is due on **Friday, 10.23** and is worth 10 points.

Exercises

1. First, let's collect a list of things to consider trying when we are confronted with an integral. The order of the list is not necessarily the order in which you should try things. Spend a couple minutes discussing when you might want to consider each of the following techniques.

   (a) ordinary u-substitution:

   (b) splitting a single rational function up into multiple rational functions

   (c) polynomial long division to rewrite integrand

   (d) integration formula

   (e) partial fractions

   (f) completing the square to rewrite integrand

   (g) trig substitution

   (h) integration by parts

   (i) using trig identities to write the integrand in more useful ways

2. OK, let's do some problems. Integrate each of the following. (Warning: there may be more than one way to do each problem. Try to find the simplest method.)

   (a) $\displaystyle\int \frac{1}{\sqrt{4-x^2}}\,dx$

(b) $\displaystyle\int \frac{x}{\sqrt{4-x^2}}\ dx$

(c) $\displaystyle\int \frac{x^3}{\sqrt{x^2-4}}\ dx$

(d) $\displaystyle\int \frac{x^3}{x^2-4}\,dx$

(e) $\displaystyle\int \frac{x^2-4}{x^3}\,dx$

(f) $\displaystyle\int \frac{1}{x^2 - 4}\, dx$

(g) $\displaystyle\int \frac{1}{x^2 + 3x - 4}\, dx$

(h) $\displaystyle\int \frac{1}{x^2 + 2x + 5}\, dx$

(i) $\displaystyle\int \sqrt{-x^2 - 2x + 3}\, dx$