Warm-Up Problems and Lecture Problems
February 10, 2003

1. Suppose you are given the following three points:

   $(-1, 1)$ $(0, 4)$ $(1, 3)$

   Your goal is to find the quadratic function that fits this data. In other words, you need to find A, B, and C so that for these three points:

   $$y = Ax^2 + Bx + C$$

   (a) Find a system of three equations and three unknowns by plugging the data points into the equation.

   (b) Solve this system of equations and write down the quadratic function that fits the data.

2. Completing the square. In case you don't remember what this means, here is an example. We will complete the square for the expression $x^2 + 6x + 25$:

$$\begin{aligned} x^2 + 6x + 25 &= x^2 + 6x + \left(\frac{6}{2}\right)^2 - \left(\frac{6}{2}\right)^2 + 25 \\ &= (x^2 + 6x + 9) - 9 + 25 \\ &= (x^2 + 6x + 9) + 16 \\ &= (x + 3)^2 + 16 \end{aligned}$$

Complete the square for the following expressions:

(a) $x^2 - 4x + 5$

(b) $5 - 4x - x^2$

Lecture Problems

3. Using the table of integrals in the back of your book, evaluate the integral.

$$\int \frac{14x^3}{\sqrt{6+5x^2}}\,dx$$

Hint 1: You might have to do a preliminary substitution or algebraic manipulation.
Hint 2: You might want to use integral number 55:

$$\int \frac{u\,du}{\sqrt{a+bu}} = \frac{2}{3b^2}(bu-2a)\sqrt{a+bu}+C$$

4. Consider the integral:

$$\int_1^3 \frac{1}{x}\, dx$$

(a) Using Simpson's Rule with $n = 6$, find an approximation for the definite integral:

(b) Compute the integral using the Fundamental Theorem of Calculus.

(c) Compute the error of Simpson's rule (i.e., how far off is Simpson's Rule?).