

**MATH 1310 Programming Project #11**  
**Using the Programs**

You have the whole class period to work on the project with your group. Use one of your programs (MSEC, NEWTON, EULER, RIEMANN) to solve each problem. Be sure to indicate which program you used, what data you needed to input to run it, and what the output was.

1. (a) Estimate  $\int_1^2 3x^2 + 5 dx$  to within 0.1 of the exact value.

(b) Find the exact value using the Fundamental Theorem of Calculus.

2. Estimate the largest real zero of  $f(x) = x^3 - x^2 - 11x + 8$  to eight decimal places of accuracy.

3. Estimate  $f'(2.3)$  for the function  $f(x) = 7^x \ln(x^2 + 4)$ .

4. Given

$$\frac{db}{dt} = (1 - 0.002b)b \quad \text{and} \quad b(0) = 200,$$

estimate  $b(2)$ ,  $b(4)$ ,  $b(6)$ ,  $b(8)$ , and  $b(10)$  using  $\Delta t = 0.1$ . You will need to modify the program EULER because this is an autonomous differential equation instead of a pure-time differential equation. Estimate  $b(2)$ ,  $\dots$ ,  $b(10)$  again using the initial condition  $b(0) = 600$ . Assuming this continuous-time dynamical system is a population model, describe what is happening in complete sentences.