Maple Workshops F7.1SC3, 2008
Assessment 3 (Week 7)

Try all questions on the assessment. At the end of the class print out your worksheet and hand it in. **Layout your worksheet neatly and clearly number each answer**.

The worksheet you hand in at the end of the class should have the following information on it at the top: **Maple Assessment 3** Your full name, Your department

1. Assign the function

$$f(x) = \left(\frac{1+x}{2+x}\right)^{\frac{1-\sqrt{x}}{1-x}}$$

   (a) Find the value of

$$\lim_{x\to 1} f(x)$$

   (b) Evaluate to 5 significant figures

$$\lim_{x\to 1} \frac{df(x)}{dx}$$

2. Plot the function

$$g(x) = \arctan(x) - \ln(1 + \frac{x^2}{10})\,.$$

   Use differentiation to find the point at which $g(x)$ takes its maximum value. Evaluate the point with the accuracy of 5 significant figures. Find the maximum value of $g(x)$ with the accuracy of 10 significant figures.

3. Plot the curves $y = 6 - x^2$ and $y = x^2/2 - 5 - x$ on a single graph. Use Maple to determine analytically where the functions cross. Then calculate the area enclosed between the two curves, giving your answer to 8 significant figures.

4. Find the general solution of the second order differential equation for $y(x)$ given by

$$xy'' + xy' - 2y = 0$$

   and then determine the specific solution which satisfies the boundary conditions

$$y(1) = 1\ , \quad y'(2) = 0\ .$$

   Graph the solution for $0 \le x \le 10$. Determine $y(0)$ to 5 significant figures.

5. Solve the recurrence relation

$$u_{n+1} = u_n \left(\frac{n+3}{n+5}\right)^2 + \frac{1}{n+5}\ ,$$

   with the initial condition $u_0 = 1$.