

## Maple Workshops F7.1SC3, 2007

### 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

$$f(x) = \left( \frac{3x^2 - x + 1}{2x^2 + x + 1} \right) \frac{x^3}{1 - x}$$

- (a) Find the value of

$$\lim_{x \rightarrow \infty} f(x)$$

- (b) Calculate the first derivative of  $f$ , i.e.  $f'(x)$  and evaluate  $f'(2)$  to 5 significant figures.

2. (a) First state then evaluate the following integral to 7 significant figures

$$\int_0^{\pi} e^{2x^{1/3}} dx$$

- (b) Plot the curves  $y = 5 - x^2$  and  $y = x + \sqrt{2}$  on a single graph and use Maple to determine where the functions cross. Thus calculate the area enclosed between the two curves, giving your answer to 8 significant figures.

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

$$x(1 - x)y'' + 2xy' - 2y = 0$$

and then determine the specific solution which satisfies the boundary conditions

$$y(1) = 0, \quad y'(2) = 3.$$

Finally graph the solution for  $0 \leq x \leq 3$ .

4. Find the solution of the differential equation for  $g(t)$  given by

$$\ddot{g} - 2\dot{g} + g = \cos(2t)$$

together with the initial conditions

$$g(0) = 0, \quad \dot{g}(0) = -1.$$

Hence determine  $g(10)$  and  $g(100)$  evaluating up to 5 significant figures.

5. Solve the recurrence relation

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

with the initial condition  $u_0 = 2/3$ .

Using your solution find the limit:  $\lim_{n \rightarrow \infty} u_n$ .