2BA1: Mathematics for Students in Computer Science
Homework problems due March 5, 2008

In all these tasks you are not allowed to use any software that contains routines for solving differential equations numerically.

1. Find general solutions for the following differential equations:
(a) $f'(x) + 3x^2 f(x) = 0$;
(b) $f''(x) - 3f'(x) + 2f(x) = e^x$;
(c) $f''(x) - 3f'(x) + 2f(x) = x$.

2. Find solutions for the following differential equations with initial/boundary/mixed data:
(a) $f''(x) - 3f'(x) + 2f(x) = 0$, $f(1) = 1$, $f'(1) = 2$;
(b) $f''(x) - 3f'(x) + 2f(x) = 0$, $f(1) = 1$, $f(2) = 1$;
(c) $f''(x) - 3f'(x) + 2f(x) = x$, $f(1) = 0$, $f(0) = f(2)$.

3. Use your favourite programming language to write a program that computes the first four decimal points of $f(1)$, where $f(x)$ is uniquely determined from

$$f'(x) = e^{-f(x)} + 0.2x f(x),$$
$$f(0) = 0.$$

4. Use your favourite programming language to write a program that computes the first four decimal points of $f(1)$, where $f(x)$ is uniquely determined from

$$f''(x) = f(x)e^{-f'(x)} - 0.1x f(x),$$
$$f(0) = 0, f'(0) = 1.$$