MATH 152 — Quiz #2

March 13, 1997

Please make sure you have received 6 pages (including this cover page) with 5 problems. You have 45 minutes for the exam, and you may attempt the problems in any order. You may use a handwritten four-page summary of your notes during this exam. No other help is allowed. Write your answers in the space provided. If you need more space, attach additional pages.

Good Luck!

Name:	
Student number:	

Problem	Maximum	Points received
1	20	
2	10	
3	30	
4	20	
5	20	
Total	100	

Problem 1 *Differential equations.* A bursary fund starts with an initial endowment of \$50,000. It is expected that the fund will raise \$4,000 monthly. Each month the entire interest income plus 2% of the total fund is paid out in bursaries.

1. Denoting by $A(t)$ the amount of money in the fund, where time t is measured in months, find a differential equation for $A(t)$.

2. Find the solution of this differential equation with the appropriate initial condition.

3. How much money is in the bursary fund in the long run ($t \to \infty$)?

Solution of Problem 1.

Problem 2 *Differential Equations.*

Find the solution y with $y(0) = 0$ of the linear first order equation

$$y'(x) + 2y(x) = 2x,$$

using variation of constants (or, by solving the homogeneous equation, and "guessing" a particular solution).

Solution of Problem 2.

Problem 3 *Integration techniques.*

(a) What is
$$\int \sin^3 x \cos^2 x \; dx?$$

(b) Evaluate the integral
$$\int x e^{-2x} dx.$$

(c) What is
$$\int_0^{\pi^2} \frac{1}{2} \cos \sqrt{x}\, dx \quad ?$$

Solution of Problem 3.

Problem 4 *Integration techniques.*

What is

$$\int \frac{x^4+1}{x(x^2+4)} dx \quad ?$$

Solution of Problem 4.

Problem 5 *Integration techniques.* Compute

$$\int \frac{1}{\sin x + \tan x} dx.$$

Solution of Problem 5.