MATH2132 Test 3 **November 24, 2011** **60 minutes**

Student Name - **Student Number -**

Values

14 **1.** (a) Find a 2-parameter family of solutions of the differential equation

$$xy'' - 3y' = x^5.$$

(b) Can there be any singular solutions to your family of solutions in part (a)? Explain.

14 **2.** Two substances A and B react to form a third substance C in such a way that 1 gram of A reacts with 1 gram of B to produce 2 grams of C. The rate at which C is formed is proportional to the product of the amounts of A and B present in the mixture. If 10 grams of A and 10 grams of B are originally brought together at time $t = 0$, find the amount of C present in the mixture as a function of time.

7 **3.** Let $\phi(m) = 0$ be the auxiliary equation associated with the differential equation $\phi(D)y = 0$. It is known that

$$\phi(m) = (m+1)(m-7)^3(m^2 - 4m + 13)^2.$$

What is a general solution of the differential equation?

15 **4.** Find a general solution of the differential equation

$$y'' - 4y' - 5y = 8xe^x.$$