Delft University of Technology, EEMCS faculty
Examination Mathematics 2, AESB1210 (test 1)
Friday, December 5th, 2014, 13.45-15.45

- It's not allowed to use a calculator or a mathematical table.
- Each answer should be clearly motivated.
- Your grade is obtained by rounding (3*score+10)/10 to one decimal place.
- Points:

Ex. 1	6	Ex. 2	5	Ex. 3	4	Ex. 4	4	Ex. 5	6	Ex. 6	5

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1. Solve the differential equation:

$$xy' + \frac{x}{x+1}y = 5x^3 \text{ if } x > 0$$

2. Solve the differential equation:

$$\frac{dy}{dx} = \frac{x-1}{x^2y^2} \text{ if } x > 0 \text{ and } y > 0$$

3. A tank initially contains 10 L of water in which there is 20 g of salt dissolved. A solution containing 4 g/L of salt is pumped into the tank at a rate of 2 L/min, and the well-stirred mixture runs out at a rate of 1 L/min. Assume that $y(t)$ is the amount of salt (measured in g) in the tank after t minutes and set up the differential equation governing this process as long as the tank doesn't overflow.
(*You don't have to solve this differential equation !*)

4. Express$(1+i)^5$ in the form $a+bi$ where $a, b \in \mathbb{R}$.

5. Find the fourth roots of -4.

6. Find the general solution of:

$$y'' + 3y' + 2y = 6xe^x$$