Norwegian University of Science and Technology
Department of Mathematical Sciences

TMA4110, Fall 2012, Test 12, week 46

Exercise group number:

Name:

NTNU username:_____@stud.ntnu.no

You have 20 minutes to solve the 3 problems. Each problem is worth 10 points, and you need at least 15 points to pass the test. Your answers must be written on this sheet of paper (you can use additional sheets if you need more space for your answers). You are allowed to use a Citizen SR-270X or Hewlett Packard HP30S calculator, and Rottman's "Matematisk formelsamling", but no books or notes.

Problem 1 Find the solution of the system

$$x_1' = 17x_1 - 15x_2$$
$$x_2' = 20x_1 - 18x_2$$

that satisfies $x_1(0) = 4$ and $x_2(0) = 5$.

Problem 2 Let $\mathbf{y} = \begin{bmatrix} -3 \\ 9 \end{bmatrix}$ and $\mathbf{u} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$. Compute the distance from $\mathbf{y}$ to the line through $\mathbf{u}$ and the origin.

Problem 3 Normalize the vectors $\begin{bmatrix} 1 \\ 4 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$, $\begin{bmatrix} -2 \\ 1 \\ -2 \end{bmatrix}$ to produce an orthonormal basis for $\mathbb{R}^3$ and find the coordinate vector of $\begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$ with respect to this orthonormal basis.