Norwegian University of Science and Technology
Department of Mathematical Sciences

TMA4115, Spring 2013, Test 10

Exercise group number:

Name:

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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 a Hewlett Packard HP30S calculator, and Rottman's "Matematisk Formelsamling", but no books or notes.

Problem 1 Find bases for $\mathrm{Col}(A)$, $\mathrm{Row}(A)$ and $\mathrm{Nul}(A)$ for the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 2 & 2 & 3 \\ 0 & 0 & 0 & 0 & 5 \end{bmatrix}.$$

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Problem 2 Let A be a 7×4 matrix. Suppose $A\begin{bmatrix} 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} = \mathbf{0}$. What is the largest possible dimension of $\mathrm{Row}(A)$? Give reasons for your answer.

Problem 3 The gates of a dam on a river are, on any one day, either raised for half a day to discharge water downstream or kept shut. It has been observed over many years that if the gates are raised on one day then there is a 90% chance that they will stay shut the next day, and that if they stay shut then there is a 20% chance that they will stay shut the next day. According to this information, what is the probability that the gates of the dam will stay shut on a given day ?