# 2.035: Midterm Exam - Part 1 (In-class) Spring 2007 

1.5 hours<br>You may use the notes you took in class and any other handwritten notes in your own handwriting. No other sources should be used.

Problem 1: Explain each of the following concepts precisely (yet succinctly):
a) a vector space;
b) a set of linearly independent vectors;
c) the dimension of a vector space;
d) a basis for a vector space;
e) the components of a vector in a basis;
f) the scalar or inner product between two vectors;
g) the distance between two vectors;
h) an orthonormal basis;
i) a linear transformation on a vector space;
j) an invariant subspace of a linear transformation;
k) the null space of a linear transformation;
$\ell)$ a singular linear transformation;
m) the components of a linear transformation in a basis; and
n) the scalar invariants of a linear transformation.

Problem 2: Give an example illustrating each concept in Problem 1.

