Technion – Israel Institute of Technology



HW1

**Vision Aided Navigation**

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November 10, 2021

# Basic Probability

## Question 1 : Consider a random vector with a Gaussian distribution.

### Write an explicit expression for .

### Consider a linear transformation . Assuming is invertible, show has a Gaussian distribution, , and find expressions of and in terms of and .

Proof that

which shows that y also has a Gaussian distribution with mean vector  
 and covariance matrix .

## Question 2 : Let be a prior distribution over with known mean and covariance . Consider a given measurement with a corresponding linear measurement model , where is a measurement matrix and is Gaussian noise with covariance . The matrices and are known.

### Write an expression for the posteriori probability function (PDF) over , , in terms of solely the prior and measurement likelihood .

### Derive analytically an expression for the maximum a posteriori (MAP) estimate and the associated covariance such that