

# Math for ML

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# 1 Differential Forms

Most of these are taken from the [Matrix Cookbook](#).

$$\frac{\partial \mathbf{x}^T \mathbf{a}}{\partial \mathbf{x}} = \frac{\partial \mathbf{a}^T \mathbf{x}}{\partial \mathbf{x}} = \mathbf{a} \quad (1)$$

$$\frac{\partial \mathbf{a}^T \mathbf{X} \mathbf{b}}{\partial \mathbf{X}} = \mathbf{a} \mathbf{b}^T \quad (2)$$

# 2 Probability Basics

## 2.1 Multivariate Gaussian Distribution

$$f(\mathbf{x}) = \frac{1}{(2\pi)^{D/2} \Sigma^{1/2}} \exp \left( -\frac{1}{2} (\mathbf{x} - \boldsymbol{\mu})^T \Sigma (\mathbf{x} - \boldsymbol{\mu}) \right) \quad (3)$$

## 2.2 Bayesian Probability

# 3 Information Theory

# 4 Linear Regression

# 5 References

Bishop, Murphy, Matrix Cookbook