# Homework LaTeXTemplate

Dr. Pablo Rivas

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## 1 Solution to Problem 1

The derivative of $g(x) = -3x^2 + 24x + -30$ is equal to $-6x + 24$. To find the value that maximizes this function we set $-6x + 24 = 0$ and solve for $x$. After solving for $x$ we get $x = 4$, which is the value for x that maximizes the function $g(x) = -3x^2 + 24x + -30$.

## 2 Solution to Problem 2

The derivative with respect to $x_0 = 9x_0^2 - 2x_1^2$.
The derivative with respect to $x_1 = -4x_0x_1 + 4$.

## 3 Problem 3

Exercise 3a. *It is not possible to multiply these two matrices.*

Exercise 3b.

$$A^T = \begin{bmatrix} 1 & 2 \\ 4 & -1 \\ -3 & 3 \end{bmatrix}$$

$$A^T B = \begin{bmatrix} -2 & -2 & 13 \\ -8 & 1 & 16 \\ 6 & -3 & -3 \end{bmatrix}$$

*$A^T B$ has a rank of 2.*

## 4 Solution to Problem 4

**Simple Gaussian**: A function of the form: $f(x) = ae^{-\frac{(x-b)^2}{2c^2}}$
**Multivariate Gaussian**: A random vector is said to be k-variate normally distributed if every linear combination of its k components has a univariate normal distribution.
**Bernoulli Distribution**: A probablity distribution of a random variable which takes the value 1 with success probability of $p$ and the value 0 with failure probability of $q = 1 - p$.
**Binomial Distribution**: A distribution giving the probability of obtaining a specified number of successes in a finite set of independent trials in which the probability of a success remains the same from trial to trial.
**Exponential Distribution**: A distribution that is used to model time between the occurrence of events in an interval of time, or the distance between events in space.

## 5 Solution to Problem 6

The expected value of for this variable is 2.5.

# 6 Solution to Problem 7

Exercise 7a. *The set $z$ is in 1 dimention, therefore we get $d = x - 1.1$. the smallest number for $x^*$ we can get while $x \in N$ is 1. Therefore $x^* = 1$.*

Exercise 7b. *$x^*$ would be located on the closet edge (the shortest linear distance) of $Z$ to $y$.*

# 7 Solution to Problem 8

Exercise 8a. *Because the random variable distribution is $e^- y$ for all positive values, it proves that the value will be 1.*

# References

[1] Huynen, M. A. and Bork, P. 1998. Measuring genome evolution. *Proceedings of the National Academy of Sciences USA* 95:5849–5856.