Homework 0

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1 Solution to Problem 1

Derivative: 0 = -6(x-4) Max: g(x) = 18 at x = 4

2 Solution to Problem 2

$$f(x) with respect to x_0 = 9x_0^2 - 2x_1^2 \tag{1}$$

$$f(x) with respect to x_1 = -4x_0x_1 + 4 \tag{2}$$

3 Solution to Problem 3

3.1

The two matricies cannot be multiplied, because the columns of the first matrix exceed the rows of the second.

3.2

A^T=[1, 2]
[4, -1]
[-3, 3]

Python verification:

```
import numpy as np

a = [[1, 2], [4, -1], [-3, 3]]
b = [[-2, 0, 5], [0, -1, 4]]

np.dot(a, b)
```

```
array([[-2, -2, 13],
       [-8,  1, 16],
       [ 6, -3, -3]])
```

4 Solution to Problem 4

Simple Gaussian - A function with normal distribution that represents data in a symmetrical bell shaped graph.

Multivariate Gaussian - Mutlivariate Gaussian distribution is the distribution of the Simple Gaussian to higher dimensions.

Bernoulli - A distribution having two possible outcomes in which success occurs with a certain probability and failure occurs with a certain probability.

Binomial - A distribution having only one outcome for each trial, with each having the same probability of success making the trial mutually exclusive.

Exponential - Given a Poisson distribution with a rate of change , the distribution of waiting times between successive changes (with k = 0) is:

$$D(x) \equiv P(X < x) = 1 - P(X > x) = 1 - e^{-}x \tag{3}$$

5 Solution to Problem 5

(graduate only)

6 Solution to Problem 6

The expected value is 2