

# Maths & Stats Pre-Sessional Tutorial

## Topic 5: Basic of Derivatives and Matrix Algebra

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### Exercise 1

Find the first derivative of the following functions:

a)  $f(x) = x^2 + 3x + 1$

b)  $f(x) = (2x - 3)^5$

c)  $f(x) = \frac{e^x}{x-1}$

d)  $f(x) = 4x^3(2x - 1)$

e)  $f(x) = \ln(3x)$

### Exercise 2

Are functions (a), (b) and (e) in Exercise 1 concave or convex? Why?

### Exercise 3

Find the stationary points of the following functions. Are they max or min?

a)  $f(x) = x^2 + 3x + 1$

b)  $f(x) = x^3 - 3x + 1$

#### Exercise 4

Consider the following matrices:

$$A = \begin{bmatrix} 5 & 1 & 0 \\ 2 & 1 & -1 \end{bmatrix}$$

$$B = \begin{bmatrix} 4 & 3 \\ 1 & 1 \\ 3 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}$$

Find:

- a)  $D = AB$
- b)  $E = D + C$
- c)  $F = AC$
- d)  $G = B'C$

#### Exercise 5

Solve the following pair of equations:

$$-y = -8x - 4$$

$$y = 20x + 2$$