1. Given the following function

$$f(x,t) = e^{-\omega\, t^2} \cos\left(\frac{n\pi x}{L}\right)$$

Find the following partial derivatives

$a)$ $\dfrac{\partial f}{\partial x}$

$b)$ $\dfrac{\partial f}{\partial t}$

2. Give an example of a linear vector space (with a basis)

3. Find the inverse for the matrix $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

4. Give a definition and an example of a supervised learning algorithm

5. Give a definition and an example of a unsupervised learning algorithm

6. Name 3 types of metrics, and their formulas, used in K-Means clustering algorithm

7. Name and describe any algorithm to inverte a Matrix

8. Explain what is a logistic regression and give an example of application (describe it as best as you can).

9. Describe in steps how would you perform preliminary analysis on a dataset

10. Given the two tables A and B, give the result for the query below

Table A

| ID | Name | Born_in |
|---|---|---|
| 9991 | John | Liverpool |
| 9992 | Paul | Liverpool |
| 9993 | Ringo | Liverpool |
| 9994 | George | Liverpool |

Table B

| ID | Instrument | Football_Club |
|---|---|---|
| 9991 | Vocal | Liverpool |
| 9992 | Base | Liverpool |
| 9993 | Drums | Liverpool |
| 9995 | Guitar | Arsenal |
| 9992 | Piano | Liverpool |

```
SELECT A.ID, A.Name, A.Born_in, B.Instrument, B.Football_Club
From A
LEFT JOIN B
ON A.ID = B.ID;
```