Introduction to Machine Learning Assignment 2

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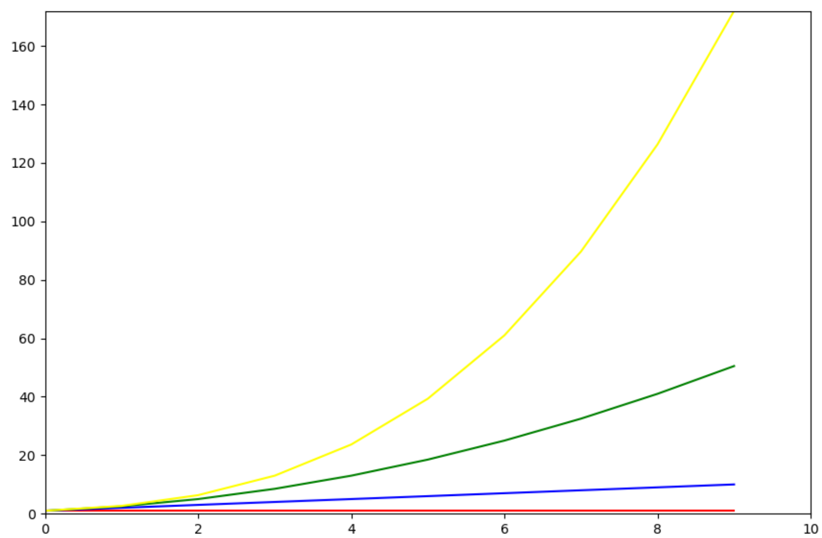
1 Q1

(a)

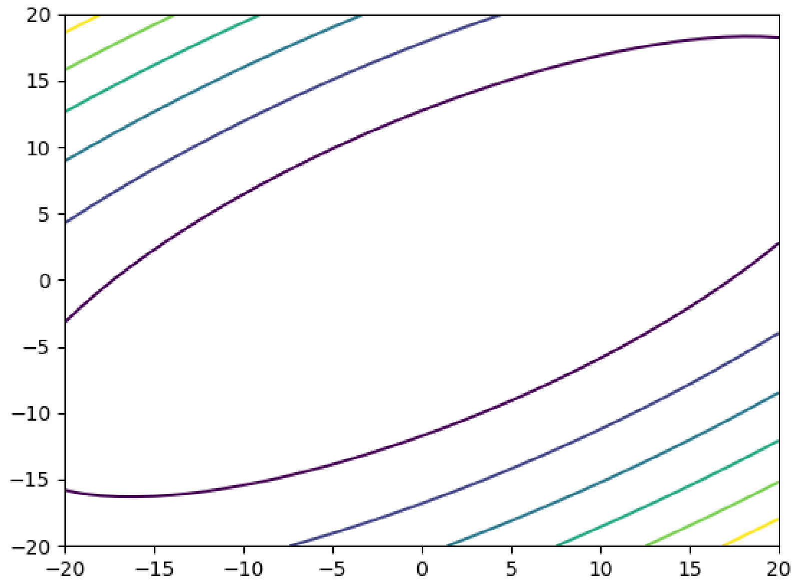
$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x + \frac{x^2}{2!}$... (this is technically the Maclaurin expansion, which is a subest of Taylor series at a=0)

(b)



graph.png

2 Q2



(a) map.png

(b)

We differentiate $J(w) = \frac{1}{2}[(w_2 - w_1)^2 + (1 - w_1)^2]$ by both w_1 and w_2, to get $\frac{\partial J}{\partial w_1} = 2w_1 - w_2 - 1$ and $\frac{\partial J}{\partial w_2} = w_2 - w_1$ giving us our gradient vector $\nabla(w) = \begin{bmatrix} 2w_1 - w_2 - 1 \\ w_2 - w_1 \end{bmatrix}$.

(c)

1. $\nabla(w) = \begin{bmatrix} 2w_1 - w_2 - 1 = 21.19 \\ w_2 - w_1 = -2.19 \end{bmatrix}$ where $x = 20, y = 17.81$
2. $\nabla(w) = \begin{bmatrix} 2w_1 - w_2 - 1 = -25.25 \\ w_2 - w_1 = 4.25 \end{bmatrix}$ where $x = -20, y = -15.75$
3. $\nabla(w) = \begin{bmatrix} 2w_1 - w_2 - 1 = -5.57 \\ w_2 - w_1 = -5.43 \end{bmatrix}$ where $x = -10, y = -15.43$

(d)

We need values such that $2w_1 - w_2 - 1 = 0$ and $w_2 - w_1 = 0$
From the second equation, we get $w_2 = w_1$, giving us $w_1 = 1$ (which means that

$w_2 = 1)$