OM Review - XXI

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https://forms.gle/DRmtfWShDFVK5EAs7

Question 1

Which of the following sets are convex

(A) R^+, set of positive real numbers

(B) Z, set of integers

(C) $\{X|c \leq AX \leq b, X \in R^2\}$

(D) $\{X|AX \leq b, X \in R^2\}$

More than one may be correct

Question 2

Which of the following functions are true for $x \in R$

(A) $f(x) = x^2$ is convex

(B) $f(x) = x^2$ is concave

(C) $f(x) = -x^2$ is convex

(D) $f(x) = -x^2$ is concave

Concave functions are defined as functions with convex domain and $\forall x, y \in dom(f), 1 \geq \theta \geq 0$ satisying the property $f(\theta x + (1-\theta)y) \geq \theta f(x) + (1-\theta)f(y)$. For example x^2 is convex whereas $-x^2$ is concave in R.

More than one maybe correct

Question 3

$f(x_1, x_2) = x^2y^3$. H is the Hessian of f. Then value of $H_{1,2}$ at $x = (1, 1)$

(A) 3

(B) 2

(C) 6

(D) None of the others

Question 4

$$u = \frac{1}{2}e^x(\cos(y) + \sin(y))$$

$$v = \frac{1}{2}e^x(\cos(y) - \sin(y))$$

Then Jacobian $|J|$ is

(A) $\frac{1}{2}e^{2x}$

(B) $-\frac{1}{2}e^{2x}$

(C) e^{2x}

(D) None of ther others

Question 5

Which of these update equations can be useful if we want to minimize a function $f(x)$

(A) $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n}$

(B) $x_{n+1} = x_n - \frac{f'(x_n)}{f''(x_n)}$

(C) $x_{n+1} = x_n - \frac{f''(x_n)}{f'''(x_n)}$

(D) None of the others

Question 6

Suppose are trying to fit a neural network by minimizing the loss using gradient descent.
Statement: Dividing the loss by 2 will make the model converge faster

(A) Statement is True

(B) Statement is False

(C) True or false depending on the weights of the neural network