

**EN.605.647.83.SP21 Neural Networks**

Course Modules

Module 2: Mathematical Machinery and Review

Review Test

Submission: Module 2 Online Assignment

Review Test Submission: Module 2 Online Assignment

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Course	EN.605.647.81.SP21 Neural Networks
Test	Module 2 Online Assignment
Started	2/4/21 8:56 PM
Submitted	2/4/21 9:12 PM
Due Date	2/9/21 11:59 PM
Status	Completed
Attempt Score	26.75 out of 33 points
Time Elapsed	15 minutes
Instructions	Answer the various questions. You may need to do some calculations before you submit your answers.
Results Displayed	Submitted Answers

Question 1

0 out of 5 points

The sigmoid activation function is used a lot in neural networks. The function has the form

$f(x) = \frac{1}{1 + e^{-x}}$. Derive the derivative of this function with respect to x , $f'(x)$, and determine the value of $f'(2)$. Submit the answer to 4 significant decimal digits.

Selected Answer: 0.1192

Question 2

5 out of 5 points

Let $f(x,y,z) = 3x^2 + 2xy + 3xz + 4yz + y^2 + xyz + 2z^3$. Answer the following questions by finding matching expressions for $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$, $\frac{\partial f}{\partial z}$.

Question

Selected Match

A. What is the correct expression for $\frac{\partial f}{\partial x}$?

C. $6x + 2y + 3z + yz$

B. What is the correct expression for $\frac{\partial f}{\partial y}$?

A. $2x + 4z + 2y + xz$

C. What is the correct expression for $\frac{\partial f}{\partial z}$?

D. $3x + 4y + xy + 6z^2$

Question 3

3.75 out of 5 points

This question further requires you to understand notational issues as they relate to partial derivatives. For this problem, consider the expression:

$$I_j = \sum_{i=1}^9 w_{ji} \theta_i \text{ for } j = 1, \dots, 4 \text{ where the } w_{ji} \text{ are the variables.}$$

Question

Selected Match

A. What is the proper expression for $\frac{\partial I_2}{\partial w_{25}}$? D. θ_s

B. What is the proper expression for $\frac{\partial I_3}{\partial w_{32}}$? G. θ_2

C. What is the proper expression for $\frac{\partial I_j}{\partial w_{rs}}$ for $r = j$? D. θ_s

D. What is the proper expression for $\frac{\partial I_j}{\partial w_{rs}}$ for $r \neq j$? C. 0

Question 4

2 out of 2 points

The following questions ask you to compute various values associated with the vectors $\mathbf{x} = (1, -1, 0)$, $\mathbf{y} = (3, 1, -2)$ (so write these vectors down). This first question asks what is the value of $|\mathbf{x}|$, that is, the Euclidean norm of \mathbf{x} ? Answer to 4 significant decimal digits.

Selected Answer: 1.4142

Question 5

2 out of 2 points

For the vector $\mathbf{y} = (3, 1, -2)$, what is the value of $|\mathbf{y}|$? Answer to 4 significant decimal digits.

Selected Answer: 3.7417

Question 6

2 out of 2 points

Given the two vectors $\mathbf{x} = (1, -1, 0)$, $\mathbf{y} = (3, 1, -2)$, what is the value of $\langle \mathbf{x}, \mathbf{y} \rangle$, i.e., the inner product or dot product? Answer to 4 significant decimal digits.

Selected Answer: 2

Question 7

2 out of 2 points

For the two vectors $\mathbf{x} = (1, -1, 0)$, $\mathbf{y} = (3, 1, -2)$, what is the angle between them? Answer the question in degrees to 4 significant decimal digits.

Selected Answer: 67.7923

Question 8

3 out of 3 points

Given the vectors $\mathbf{x} = (1, -1, 0)$, $\mathbf{y} = (3, 1, -2)$, determine the outer product matrix, $\mathbf{x}^T \mathbf{y}$, and then submit the sum of the elements of the middle row. Enter the value to 1 significant decimal digit.

Selected Answer: -2

Question 9

7 out of 7 points

Given the function $f(x, y, z) = 2xy - 3xz^2$, calculate the directional derivative in the direction of point $(3, 2, 1)$ from the point $(1, 2, 3)$. Answer to 4 significant decimal digits.

Selected Answer: -3.5355

Thursday, February 4, 2021 9:12:33 PM EST

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