Final Assessment

Due No due date **Points** 15 **Questions** 15 **Time Limit** None
Allowed Attempts Unlimited

Instructions

Now that you have practiced solving linear algebra problems in high dimension, you can test your knowledge with this self-graded assessment. We strongly recommend that you take this quiz to assess your preparation for the computations in the eCornell Machine Learning certificate.

Take the Quiz Again

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	1,517 minutes	15 out of 15

Last Attempt Details:

Time:	1,517 minutes
Current Score:	15 out of 15
Kept Score:	15 out of 15

Unlimited Attempts

Take the Quiz Again

(Will keep the highest of all your scores)

Submitted Sep 27 at 2:28pm

Question 1 — 1 / 1 pts

Consider the vectors $\mathbf{x} = \begin{pmatrix}1\\2\\3\\4\\5\end{pmatrix}$ and $\mathbf{y} = \begin{pmatrix}-1\\-1\\-3\\5\\2\end{pmatrix}$. What is the dot product of $\mathbf{x}$ and $\mathbf{y}$?

$\mathbf{x}\cdot\mathbf{y}$ = 18

Answer 1:

Correct Answer 18

That is correct!

$\mathbf{x}\cdot\mathbf{y}$ = 1 ·(-1) + 2 ·(-1) + 3 ·(-3) + 4 ·5 + 5 ·2 = 18

Question 2 — 1 / 1 pts

Consider the vector $\mathbf{v} = \begin{pmatrix}-3\\1\\5\\-1\end{pmatrix}$. What is the length of $\mathbf{v}$?

$||\mathbf{v}||$= 6

Answer 1:

Correct Answer 6

That's correct!

$||\mathbf{v}|| = \sqrt{(-3)^2 + 1^2 + 5^2 + (-1)^2} = \sqrt{36} = 6$

Question 3 — 1 / 1 pts

Are the vectors $\mathbf{x} = \begin{pmatrix}1\\2\\-3\\2\end{pmatrix}$ and $\mathbf{y} = \begin{pmatrix}2\\2\\2\\0\end{pmatrix}$ orthogonal?

Correct! ◉ Yes

Because $\mathbf{x}\cdot\mathbf{y}$ = 1 · 2 + 2 · 2 + (-3) · 2 + 2 · 0 = 0.

○ No

Question 4 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w} = \begin{pmatrix}2\\1\\3\end{pmatrix}$ and b = -6.

Is the point P_1 = (-1, -1, -1) on the plane?

Correct! ◉ Yes

That's correct! P_1 is on the plane because

$\mathbf{w}\cdot\mathbf{p}_1$ = (-1 · 2) + (-1 · 1) + (-1 · 3) = (-2) + (-1) + (-3) = -6.

○ No

Question 5 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w} = \begin{pmatrix}2\\1\\3\end{pmatrix}$ and b = -6.

Is the point P_2 = (1, -2, -2) on the plane?

Correct! ◉ Yes

That's correct! P_2 is on the plane because

$\mathbf{w}\cdot\mathbf{p}_2$ = (2 · 1) + (1 · -2) + (3 · -2) = 2 - 2 - 6 = -6.

○ No

Question 6 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w} = \begin{pmatrix}2\\1\\3\end{pmatrix}$ and b = -6.

Is the point P_3 = (-2, -2, 0) on the plane?

Correct! ◉ Yes

That's correct! P_3 is on the plane because

$\mathbf{w}\cdot\mathbf{p}_3$ = (-2 ·2) + (-2 ·1) + (0 · 3) = -4 - (-2) + 0 = -6.

○ No

Question 7 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w} = \begin{pmatrix}2\\1\\3\end{pmatrix}$ and b = -6.

Is the point P_4 = (2, 3, -4) on the plane?

Correct! ◉ No

That's correct! P_4 is not on the plane because $\mathbf{w}\cdot\mathbf{p}_4$ = [illegible]

○ Yes

Question 8 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w} = \begin{pmatrix}2\\1\\3\end{pmatrix}$ and b = -6.

Is the point P_5 = (1, 1, -3) on the plane?

Correct! ◉ Yes

That's correct! P_5 is on the plane because $\mathbf{w}\cdot\mathbf{p}_5$ = [illegible]

○ No

Question 9 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w}$ = [illegible] and b = 5.

Are the points P_1 = [illegible] and P_2 = [illegible] on the same side of the hyperplane or opposite sides of the hyperplane?

Correct! ◉ The same side

Correct!

[illegible]

○ The opposite side

Question 10 — 1 / 1 pts

Consider the plane given by $\mathbf{w}\cdot\mathbf{x} = b$, where $\mathbf{w}$ = [illegible] and b = 0. Which of the following points are located closest to the hyperplane?

a. P_1 = [illegible]

b. P_2 = [illegible]

c. P_3 = [illegible]

d. P_4 = [illegible]

Correct! ◉ a and b

That's correct! The distances are:

P_1: $d_1 = \frac{3}{6}$ = 0.5

P_2: $d_2 = \frac{-3}{6}$ = - 0.5

P_3: $d_3 = \frac{5}{6}$ ~ 0.83

P_4: $d4 = \frac{-9}{6}$ = - 1.5

○ a and c

○ c and d

○ b and c

Question 11 — 1 / 1 pts

Compute $\begin{pmatrix}0&2&4\\1&3&5\end{pmatrix}\cdot\begin{pmatrix}-1&6&8\\-2&7&9\end{pmatrix}^T$.

$\begin{pmatrix}44 & 50\\ 57 & 64\end{pmatrix}$ Answer 1:

Correct! 44

Answer 2:

Correct! 57

Answer 3:

Correct! 50

Answer 4:

Correct! 64

Correct

$$\begin{pmatrix}0&2&4\\1&3&5\end{pmatrix}\cdot\begin{pmatrix}-1&-2\\6&7\\8&9\end{pmatrix} = \begin{pmatrix}0\cdot(-1)+2\cdot6+4\cdot8 & 0\cdot(-2)+2\cdot7+4\cdot9\\1\cdot(-1)+3\cdot6+5\cdot8 & 1\cdot(-2)+3\cdot7+5\cdot9\end{pmatrix} = \begin{pmatrix}44&50\\57&64\end{pmatrix}$$

Question 12 — 1 / 1 pts

Consider the matrices $A = \begin{pmatrix}3&12\\4&2\end{pmatrix}$, $B = \begin{pmatrix}1&5&-1\\2&-2&4\end{pmatrix}$, and $C = \begin{pmatrix}0&0&5\\1&0&9\\2&4&-2\end{pmatrix}$.

Which of the following products are possible to compute?

a. AB

b. BA

c. AB^T

d. B^TA

e. AC

f. BC

Correct! ◉ a, d, and f

That's correct!

The number of columns of the first matrix must equal the number of rows of the second matrix. Since A is 2 × 2, B is 2 × 3, B^T is 3 × 2, C is 3 × 3, and C^T is 3 × 3, you can compute only the following:

AB

B^TA

BC

BC^T

CB^T

○ b, c, and d

○ c and d

Question 13 — 1 / 1 pts

Are these two matrices inverse of each other?

$\begin{pmatrix}1&2&2\\0&1&1\\0&2&3\end{pmatrix}$ and $\begin{pmatrix}1&-2&0\\0&3&-1\\0&-2&1\end{pmatrix}$

Correct! ◉ Yes

That's correct!

The two matrices are inverse of each other because $\begin{pmatrix}1&2&2\\0&1&1\\0&2&3\end{pmatrix}\begin{pmatrix}1&-2&0\\0&3&-1\\0&-2&1\end{pmatrix} = \begin{pmatrix}1&0&0\\0&1&0\\0&0&1\end{pmatrix}$ and $\begin{pmatrix}1&-2&0\\0&3&-1\\0&-2&1\end{pmatrix}\begin{pmatrix}1&2&2\\0&1&1\\0&2&3\end{pmatrix} = \begin{pmatrix}1&0&0\\0&1&0\\0&0&1\end{pmatrix}$.

○ No

Question 14 — 1 / 1 pts

Which of the following matrices are symmetric?

$A = \begin{pmatrix}1&0\\0&3\end{pmatrix}$, $B = \begin{pmatrix}1&0&5\\0&-2&1\\5&1&9\end{pmatrix}$, $C = \begin{pmatrix}1&1\\2&2\\3&3\end{pmatrix}$,

$D = \begin{pmatrix}2&-2&0\\2&1&3\\0&3&4\end{pmatrix}$, and $E = \begin{pmatrix}2&1\\3&-2\end{pmatrix}$.

Correct! ◉ A and B

That's correct! Each is a square matrix and each is symmetric.

○ C and D

Question 15 — 1 / 1 pts

True or false?

Matrix A of size n × n is positive semi-definite when $\mathbf{x}^TA\mathbf{x} \geq 0$ for all vectors $\mathbf{x}$ of size n × 1.

Correct! ◉ True

That's correct!

○ False