Week 2 Assignment

The due date for submitting this assignment has passed. Due on 2017-02-08, 23:30 IST.

As per our records you have not submitted this assignment.

1) Question 1: How does the contours of $\| \cdot \|_{\infty}$ and $\| \cdot \|_1$ norm look like in 2 dimension? (Multiple choices can be correct.)

- Diamond shape
- Square
- Circle
- None of the Above

No, the answer is incorrect.
Score: 0
Accepted Answers:
- Diamond shape
- Square

2) Question 2: Consider a line $L$ in $\mathbb{R}^2$ given by $y = 2x$ i.e $L = \{r(1, 2) : r \in \mathbb{R}\}$
Now let $P = (2, 1)$ and answer the following question:- What is the point on $L$ closest to $P$?

- \( \left( \frac{2}{5}, \frac{7}{2} \right) \)
- \( \left( \frac{4}{3}, \frac{8}{3} \right) \)
- \( \left( \frac{7}{5}, \frac{14}{3} \right) \)
- None of the Above

No, the answer is incorrect.
Score: 0
Accepted Answers:
- \( \left( \frac{4}{3}, \frac{8}{3} \right) \)

3) Question 3: In the question above, what is the distance of $P$ from the line $L$?

- $\sqrt{45} / 5$
- $7\sqrt{5} / 3$
- $\sqrt{45} / 3$

Score: 0
22/07/2020

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ \frac{\sqrt{45}}{5} \]

4) Question 4: Given 2 time limited signal, are they orthogonal?
\[ x[n] = \{1, 5, 12, -6, 7\} \]
\[ y[n] = \{-2, 6, 2, 5, 3\} \]

Note: First entry in each sequence represents the starting/zeroth index.

No, the answer is incorrect.
Score: 0
Accepted Answers:
No

5) Question 5: What are the \( l_0, l_1, l_2 \) and \( l_{\infty} \) norms of \( x \) where \( x \) is defined as:
\[ x = (1, 0, 0, 1, 1, \cdots)_{\times n} \]

\[ n - 2, n - 2, \sqrt{n - 2}, 1 \]
\[ n, n - 2, \sqrt{n - 2}, 1 \]
\[ n, n - 2, \sqrt{n}, 1 \]
None of the Above

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ n - 2, n - 2, \sqrt{n - 2}, 1 \]

6) Question 6: Find the energy of the signal below:
\[ F(f) = T_sinc(fT) \]

\[ T^2 \]
\[ T^4 \]
\[ T^\frac{1}{2} \]
\[ T \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ T \]

7) Question 7: Find the angle between the below signals
\[ x(t) = t^2 \]
\[ y(t) = t - 2t^2 \]
Assume both the signals to be defined for the interval \([0,1]\).
166.44 degrees
156.71 degrees
179.13 degrees
110.78 degrees

No, the answer is incorrect.
Score: 0
Accepted Answers:
156.71 degrees

8) Question 8: Which of the following are valid norms? (Multiple choices can be correct) 1 point

☐ $l_1$
☐ $l_2$
☐ $l_3$
☐ $l_{-3}$
☐ $l_9$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$l_3$
$l_9$

9) Question 9: Which of the following pair of functions are orthogonal? (More than one may be correct) 1 point

☐ $\phi(t), \psi(2t)$
☐ $\phi(t), \psi(t)$
☐ $\phi(t - m), \psi(t - n), m \neq n$
☐ All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

10) Question 10: Which of the following is a subspace of $\mathbb{R}^3$. (More than one may be correct): 1 point

☐ $V = \{(a, b, c) | a, b, c \in \mathbb{R}, \ a + b = p, \ p > 0\}$
☐ $V = \{(a, b, c) | a, b, c \in \mathbb{R}, \ a + b = 0\}$
☐ $V = \{(a, a + 1, 0) | a \in \mathbb{R}\}$
☐ $V = \{(a, 2a, 3a) | a \in \mathbb{R}\}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$V = \{(a, b, c) | a, b, c \in \mathbb{R}, \ a + b = 0\}$
$V = \{(a, 2a, 3a) | a \in \mathbb{R}\}$
For piece-wise constant representation of a function in an interval, we have used the average value of
the function in the given interval. Suppose we devise a new scheme in which we take the average of the
maximum and minimum of the function in that interval. For example, piece-wise constant representation
of a function in the interval \([0,1]\) would be the average of maxima and minima of the function in the
interval \([0,1]\).

Now consider the following function:

\[
 f(t) = \begin{cases} 
 t^3 & |t| < 1 \\
 0 & else 
\end{cases}
\]

Question 11: What will be the representation of the function in the space \(V_0\) using the piece-wise
constant representation scheme covered in the lecture (let us call this scheme A i.e, taking the average
of the function in an interval as it's piece-wise constant value in that interval)

No, the answer is incorrect.
Score: 0

Accepted Answers:

\(-\frac{1}{4}, \frac{1}{4}\)

Question 12: Find the representation of a function in \(V_0\) using the new scheme mentioned in the
passage above. (Let us call this scheme B, i.e, taking the average of maximum and minimum value to
be piece-wise constant value in a given interval)

No, the answer is incorrect.
Score: 0

Accepted Answers:

\(-\frac{1}{2}, \frac{1}{2}\)

Question 13: Find out the representation of the function in \(V_1\) using the scheme B.
Question 14: We define error between the function and its piece-wise constant representation as
\[ e(t) = (f(t) - f'(t))^2, \]
where \( f(t) \) is the original function and \( f'(t) \) is its piece-wise constant representation at any given resolution. What is the average value of error using Scheme A and Scheme B respectively?

\[ \frac{-9}{8}, \frac{-1}{16}, \frac{1}{16}, \frac{9}{8} \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ \frac{-9}{16}, \frac{-1}{16}, \frac{1}{16}, \frac{9}{16} \]

\[ \frac{9}{56}, \frac{1}{7} \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[ \frac{9}{112}, \frac{1}{7} \]