

## Unit 11 - Week 9

## Course outline

How does an NPTEL online course work?

MATLAB

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Cubic Spline (contd...)

Curve Fitting

Quadratic Polynomial Fitting and Code for Lagrange's Interpolating Polynomial using Octave

Matlab Code for Newton's Divided Difference and Least Square Approximation

Matlab Code for Cubic Spline

Numerical Differentiation

Feedback Form

Quiz : Assignment 9

Week 10

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Week 12

Assignment Solutions

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## Assignment 9

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-11-18, 23:59 IST.

1) If  $S$  is a natural cubic spline that passes through the points  $(1, 2), (2, 3)$  and  $(3, 5)$ . The value of  $\frac{dS}{dx}$  at  $x = 1.5$  most nearly is 1 point

- 2.5  
 1.2  
 0.94  
 0.50

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.94

2) What form does the truncation error take for the difference formula  $f'(x) \approx \frac{f(x+h) - f(x-h)}{2h}$ ? 1 point

- $O(1)$   
  $O(h)$   
  $O(2h)$   
  $O(h^2)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$O(h^2)$

3) Suppose that 1 point

$$S(x) = \begin{cases} 1 + ax + x^2 - x^3 & \text{if } 0 \leq x \leq 1 \\ 1 + b(x-1) - 2(x-1)^2 + (x-1)^3 & \text{if } 1 \leq x \leq 2, \end{cases}$$

is a clamped cubic spline. What are the clamped end point slopes ?

- $S'(0) = 0, S'(2) = -1$   
  $S'(0) = 1, S'(2) = -2$   
  $S'(0) = 0, S'(2) = -2$   
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

$S'(0) = 0, S'(2) = -2$

4) Use the Backward-difference formula to approximate the derivative of  $f(x) = \sin x$  at  $x_0 = 0.6$  with  $h = 0.1$  1 point

- 0.7520  
 0.8520  
 0.6530  
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.8520

5) If we are using forward difference formula to approximate the derivative of  $f(x) = \ln x$  at  $x_0 = 1.8$  using  $h = 0.1$ . Determine bounds for the approximation error. 1 point

- 0.12758  
 0.01067  
 0.01543  
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.01543

6) Find the least squares line approximating the following data 1 point

$x$	1	2	3	4	5	6	7	8	9	10
$y$	1.3	3.5	4.2	5.0	7.0	8.8	10.1	12.5	13.0	15.6

- $1.538x - 0.360$   
  $1.2x - 1.7$   
  $2.2x - 0.75$   
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

$1.538x - 0.360$

7) If we fit the following data with least squares polynomial of degree two. 1 point

$x$	0	0.25	0.5	0.75	1
$y$	1	1.2840	1.6487	2.1170	2.7183

What is the total error  $E$ ?

- 0.000274  
 0.00156  
 0.01375  
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

0.000274

8) Find the least squares approximating polynomial of degree two for the function  $f(x) = \sin \pi x$  on the interval  $[0, 1]$ . 1 point

- $3x^2 + 2.5x - 0.5$   
  $-4.1225x^2 + 4.12251x - 0.050465$   
  $5.7521x^2 + 3.2375x - 0.4$   
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

$-4.1225x^2 + 4.12251x - 0.050465$

For Q9-10: Consider the following table

$x$	4	4.2	4.5	4.7	5.2	5.5	5.9	6.3	6.8	7.1
$y$	102.56	113.18	130.11	142.05	167.53	195.14	224.87	256.73	299.50	326.72

9) Construct the least squares approximation of the form  $be^{ax}$  1 point

- $y = 12.43e^{0.5x}$   
  $y = 24.26e^{0.3724x}$   
  $y = 15.67e^{0.75x}$   
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

$y = 24.26e^{0.3724x}$

10) Construct the least squares approximation of the form  $bx^a$  1 point

- $y = 7.5x^{3.54}$   
  $y = 2.3x^{4.76}$   
  $y = 6.24x^{2.02}$   
 None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

$y = 6.24x^{2.02}$