CSU33081 Assignment 2 Multiple Choice Answers

Please enter your answers (A – E)

Q 1 Answer: C

```
>> FUN = @(x)8-4.5 * (x-sin(x))

FUN =

  function_handle with value:

    @(x)8-4.5*(x-sin(x))

>> sol=fzero(FUN,2)

sol =

    2.4305
```

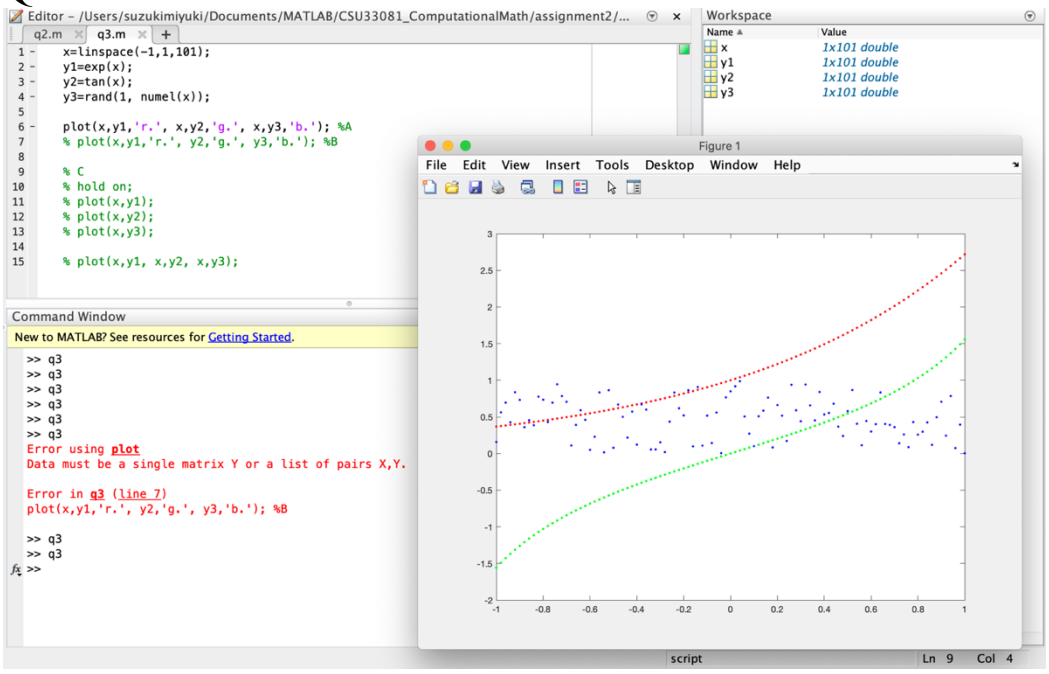
Q2 Answer: A

A

4x4 double

	1	2	3	4	5	6	7	8	9	10
1	1	-1	1	1						
2	-1	1	1	1						
3	-1	-1	3	1						
4	-1	-1	1	3						
5										
6										
7										
8										
9										
10										
11										

Q3 Answer: A



Q 4 Answer: C

$\lambda = 1$ $-(1)^3 + 12(1) + 16 \neq 0$

$\lambda = -1$ $-(-1)^3 + 12(-1) + 16 \neq 0$

$\lambda = 2$ $-(2)^3 + 12(2) + 16 \neq 0$

$\lambda = -2$ $-(-2)^3 + 12(-2) + 16 = 0$

$$\lambda + 2 \;\overline{)\; \lambda^3 - 12\lambda + 16}$$

$\lambda^2 - 2\lambda - 8$

$+) -\lambda^3 - 2\lambda^2$

$-2\lambda^2 - 12\lambda$

$+) +2\lambda^2 + 4\lambda$

$-8\lambda + 16$

$-8\lambda - 16$

0

$(\lambda+2)(\lambda^2 - 2\lambda - 8) = (\lambda+2)(\lambda+2)(\lambda-4)$

$\lambda = -2, 4$. thus, $-2, 4$ are eigen values.

$\lambda = -2$

$$A - \lambda I = \begin{pmatrix} 3 & -3 & 3 \\ 3 & -3 & 3 \\ 6 & -6 & 6 \end{pmatrix}$$

$$\begin{pmatrix} 3 & -3 & 3 \\ 3 & -3 & 3 \\ 6 & -6 & 6 \end{pmatrix} = \begin{pmatrix} 1 & -1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$$x = \begin{pmatrix} x_2 - x_3 \\ x_2 \\ x_3 \end{pmatrix}$$

$$A - \lambda I = \begin{pmatrix} 1-\lambda & -3 & 3 \\ 3 & -5-\lambda & 3 \\ 6 & -6 & 4-\lambda \end{pmatrix}$$

$\det(A - \lambda I) = (-\lambda+1)(-\lambda-5)(-\lambda+4)$
$+ (-3) \cdot 3 \cdot 6 + 3 \cdot 3 \cdot (-6)$
$- 6 \cdot (-\lambda - 5) \cdot 3$
$- (-6) \cdot 3 \cdot (-\lambda + 1)$
$- (-\lambda+4) \cdot 3 \cdot (-3)$

$(-\lambda+1)(-\lambda-5)(-\lambda+4)$
$= (\lambda^2 + 5\lambda - \lambda - 5)(-\lambda+4)$
$= (\lambda^2 + 4\lambda - 5)(-\lambda+4)$
$= -\lambda^3 - 4\lambda^2 + 5\lambda + 4\lambda^2 + 16\lambda - 20$
$= -\lambda^3 + 21\lambda - 20$

$+(-3) \cdot 3 \cdot 6 + 3 \cdot 3 \cdot (-6) = -54 - 54 = -108$

$-6 \cdot (-\lambda - 5) \cdot 3 = -(-6\lambda - 30) \cdot 3 = -(-18\lambda - 90) = 18\lambda + 90$

$-(-6) \cdot 3 \cdot (-\lambda + 1) = -(-6)(-3\lambda + 3) = 6(-3\lambda + 3) = -18\lambda + 18$

$-(-\lambda+4) \cdot 3 \cdot (-3) = -(-\lambda+4)(-9) = -(9\lambda - 36) = -9\lambda + 36$

$\det(A - \lambda I) = -\lambda^3 + 21\lambda - 20$
$- 108$
$+ 18\lambda + 90$
$- 18\lambda + 18$
$- 9\lambda + 36$
$= -\lambda^3 + 12\lambda + 16$

$$X = \begin{pmatrix} -\frac{1}{2}x_3 \\ -\frac{1}{2}x_3 \\ x_3 \end{pmatrix}$$

$$= x_3 \begin{pmatrix} -\frac{1}{2} \\ -\frac{1}{2} \\ 1 \end{pmatrix}$$

Therefore, if $x_3 = 1$. $X = \begin{pmatrix} -\frac{1}{2} \\ -\frac{1}{2} \\ 1 \end{pmatrix}$ is an eigen vector.

Therefore if: $x_2 = 1$. $x_3 = 0$ $X = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$ is eigen vector

else if $x_2 = 0$, $x_3 = 1$ $X = \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix}$ is an eigenvector.

$\lambda_2 = 4$.

$$A - \lambda_2 I = \begin{pmatrix} -3 & -3 & 3 \\ 3 & -9 & 3 \\ 6 & -6 & 0 \end{pmatrix}$$

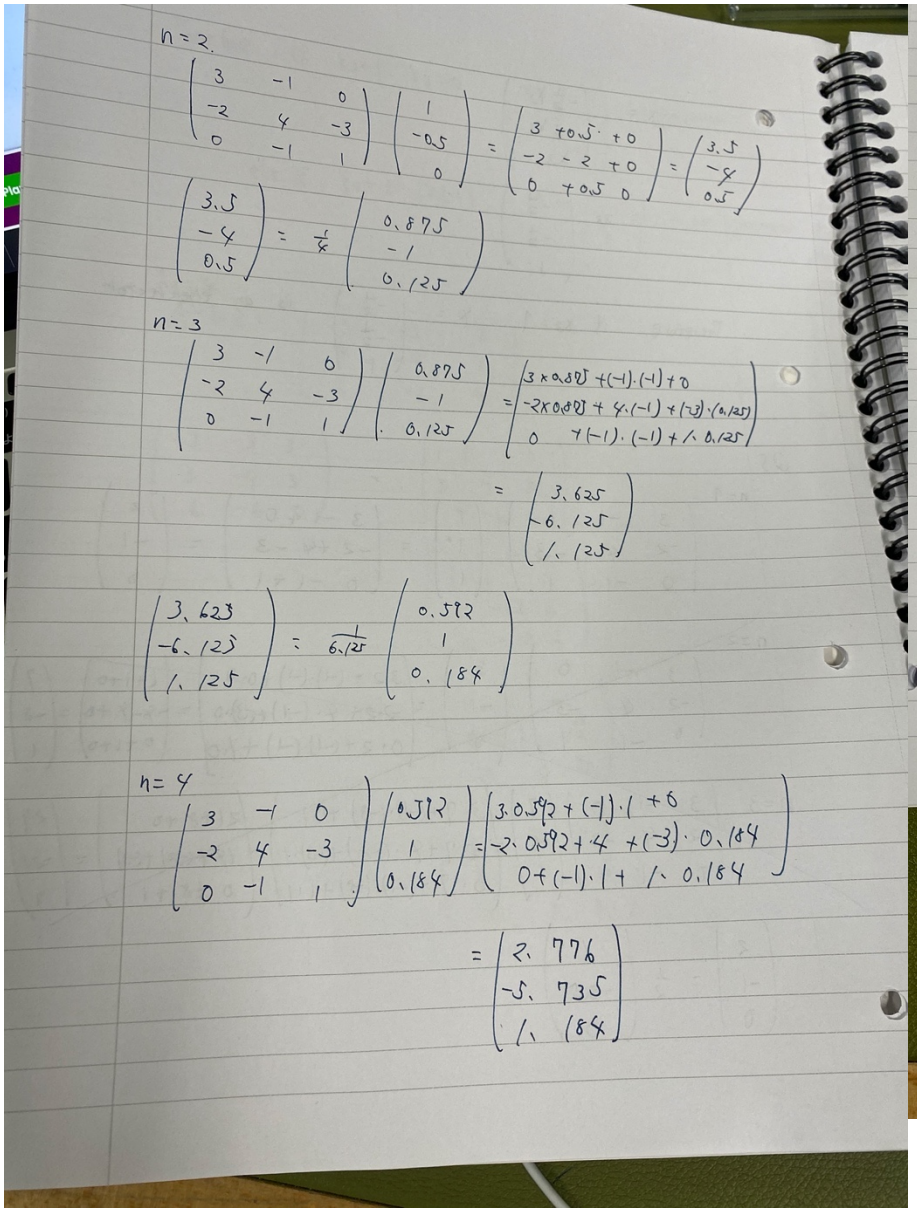
$$\begin{pmatrix} -3 & -3 & 3 \\ 3 & -9 & 3 \\ 6 & -6 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 1 & -1 \\ 3 & -9 & 3 \\ 6 & -6 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 1 & -1 \\ 0 & -12 & 6 \\ 0 & -12 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 1 & -1 \\ 0 & 1 & -\frac{1}{2} \\ 0 & 0 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 0 & -\frac{1}{2} \\ 0 & 1 & -\frac{1}{2} \\ 0 & 0 & 0 \end{pmatrix}$$

Q 5 Answer: E



$n=2$

$$\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -0.5 \\ 0 \end{pmatrix} = \begin{pmatrix} 3+0.5+0 \\ -2-2+0 \\ 0+0.5+0 \end{pmatrix} = \begin{pmatrix} 3.5 \\ -4 \\ 0.5 \end{pmatrix}$$

$$\begin{pmatrix} 3.5 \\ -4 \\ 0.5 \end{pmatrix} = \frac{1}{4} \begin{pmatrix} 0.875 \\ -1 \\ 0.125 \end{pmatrix}$$

$n=3$

$$\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 0.875 \\ -1 \\ 0.125 \end{pmatrix} = \begin{pmatrix} 3\times 0.875+(-1)\cdot(-1)+0 \\ -2\times 0.875+4\cdot(-1)+(-3)\cdot(0.125) \\ 0+(-1)\cdot(-1)+1\cdot 0.125 \end{pmatrix}$$

$$= \begin{pmatrix} 3.625 \\ -6.125 \\ 1.125 \end{pmatrix}$$

$$\begin{pmatrix} 3.625 \\ -6.125 \\ 1.125 \end{pmatrix} = \frac{1}{6.125} \begin{pmatrix} 0.592 \\ 1 \\ 0.184 \end{pmatrix}$$

$n=4$

$$\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 0.592 \\ 1 \\ 0.184 \end{pmatrix} = \begin{pmatrix} 3\cdot 0.592+(-1)\cdot 1+0 \\ -2\cdot 0.592+4+(-3)\cdot 0.184 \\ 0+(-1)\cdot 1+1\cdot 0.184 \end{pmatrix}$$

$$= \begin{pmatrix} 2.776 \\ -5.735 \\ 1.184 \end{pmatrix}$$

Therefore, if $x_3=1$, $x = \begin{pmatrix} -\frac{1}{2} \\ -\frac{1}{2} \\ 1 \end{pmatrix}$ is an eigen vector.

Q5

$n=1$

$$\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 3-1+0 \\ -2+4-3 \\ 0-1+1 \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}$$

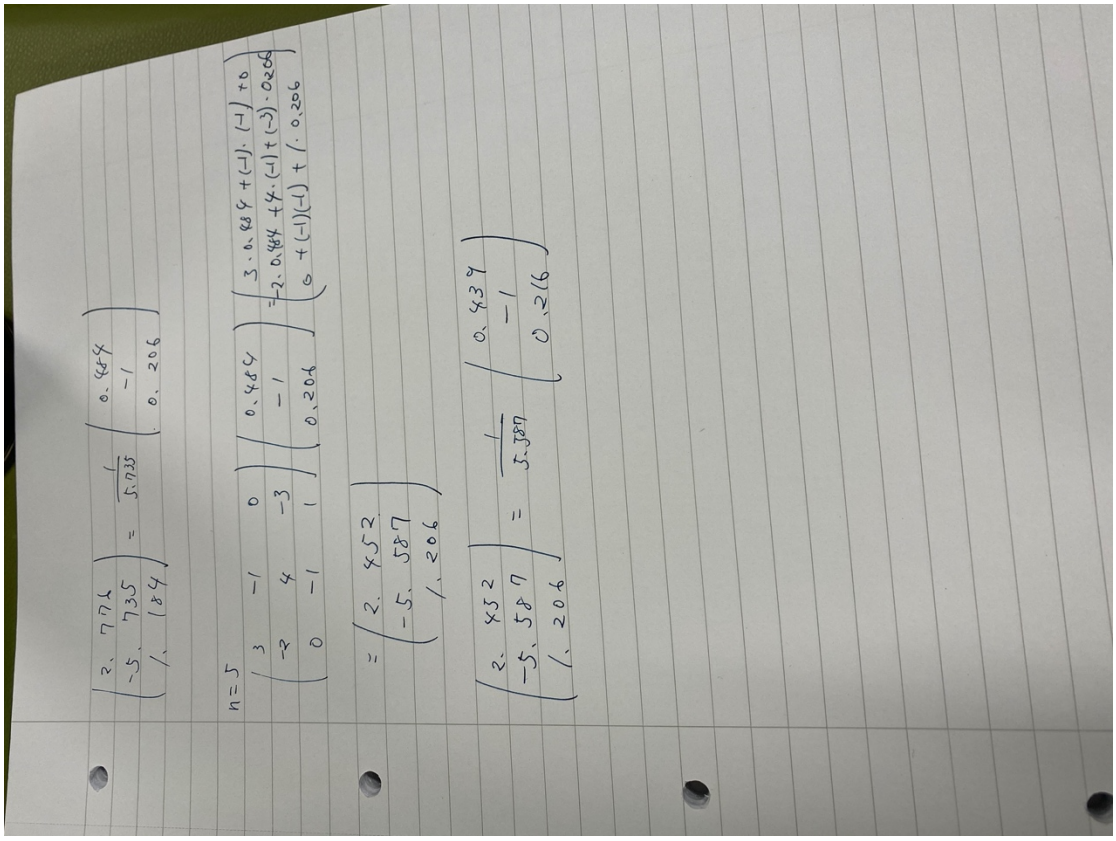
$n=2$

$$\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix} = \begin{pmatrix} 3\cdot 2+(-1)\cdot(-1)+0\cdot 0 \\ -2\cdot 2+4\cdot(-1)+(-3)\cdot 0 \\ 0\cdot 2+(-1)\cdot(-1)+1\cdot 0 \end{pmatrix} = \begin{pmatrix} 6+1+0 \\ -4-4+0 \\ 0+1+0 \end{pmatrix} = \begin{pmatrix} 7 \\ -8 \\ 1 \end{pmatrix}$$

$n=3$

$$\begin{pmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 7 \\ -8 \\ 1 \end{pmatrix} = \begin{pmatrix} 3\cdot 7+(-1)\cdot(-8)+0\cdot 1 \\ -2\cdot 7+4\cdot(-8)+(-3)\cdot 1 \\ 0\cdot 7+(-1)\cdot(-8)+1\cdot 1 \end{pmatrix} = \begin{pmatrix} 21+8+0 \\ -14-32+(-3) \\ 0+8+1 \end{pmatrix} = \begin{pmatrix} 29 \\ -21 \\ 9 \end{pmatrix}$$

$$\begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix} = \frac{1}{2} \begin{pmatrix} 1 \\ -0.5 \\ 0 \end{pmatrix}$$



Q 6 Answer: B

Sx = 700
Sy = 1860
Sxy = 118600
Sxx = 44200
N= 12
A1 = NSxy -SxSy/NSxx – (Sx)^2
=12*118600 – 700*1860/12*44200-700^2
= 3
A0 = SxxSy -SxySx/NSxx – (Sx)^2
=44200*1860 – 118600*700/12*44200-700^2
=-20
Y=3x-20

(i) Y = 3(35)-20 = 85
(ii) Y = 3(85)-20 = 235
(iii) Y = 3(100)-20 = 280

Q 7 Answer: D

S(Pie^0.1315i) = 1.15* e^0.1315*0.32 + 1.10* e^0.1315*0.64 + 1.05* e^0.1315*1.28 + 0.95* e^0.1315*1.60 = 4.704
S(e^0.263*i) = e^0.263*0.32 + e^0.263*0.64 + e^0.263*1.28 + e^0.263*1.60 = 5.173
K1 = 4.704/5.173 = 0.9093

P(sea_level) = 0.9093 * e^-0.1315*0 = 0.9093
P(top) = 0.9093 * 1/1000 = 0.0009093

e^-0.1315*a = 0.0009093/0.9093
a = ln(0.001)/-0.01315 = 52.53
Therefore, the anwer is D

Q 8 Answer: C

P2(x) = Y(x) = (x-x2)/(x1-x2) * y1 + (x-x1)/(x2-x1) * y2
=(x-15)/(0-15) * 22 + (x-0)/(15-0) * 24

f(x) = 2/15*x + 22
f(16) = 2/15* 16 + 22 = 24.13
Y(16) =((16-15)/(0-15) * 22) + ((16-0)/(15-0) * 24)
=24.1333

a2*x1^2 + a1*x1 + a0 = y0
a2*x2^2 + a1*x2 + a0 = y2
a2*x3^2 + a1*x3 + a0 = y3

a2*15^2 + a1*15 + a0 = 24
a2*18^2 + a1*18 + a0 = 37
a2*22^2 + a1*22 + a0 = 25

a2 = -22/21
a1 = 817/21
a0 = -2267/7

f(x) = (-22/21)*x^2 + (817/21)*x + (-2267/7)
f(16) = (-22/21)*16^2 + (817/21)*16 + (-2267/7) = 30.42857

Therefore, the answer is C.

Q 9 Answer: E

P3(x) = Y(x) = y0L0(x) + y1L1(x) + y2L2(x) + y3L3(x) + y4L4(x)
L0(x) = (x-0.5) (x-1.0) (x-1.5) (x-2.0)/ (0.0-0.5) (0.0-1.0) (0.0-1.5) (0.0-2.0)
L1(x) = (x-0.0) (x-1.0) (x-1.5) (x-2.0)/ (0.5-0.0) (0.5-1.0) (0.5-1.5) (0.5-2.0)
L2(x) = (x-0.0) (x-0.5) (x-1.5) (x-2.0)/ (1.0-0.0) (1.0-0.5) (1.0-1.5) (1.0-2.0)
L3(x) = (x-0.0) (x-0.5) (x-1.0) (x-2.0)/ (1.5-0.0) (1.5-0.5) (1.5-1.0) (1.5-2.0)
L4(x) = (x-0.0) (x-0.5) (x-1.0) (x-1.5)/ (2.0-0.0) (2.0-0.5) (2.0-1.0) (2.0-1.5)

Therefore, Y(x) = 0.00((x-0.5) (x-1.0) (x-1.5) (x-2.0)/ (0.0-0.5) (0.0-1.0) (0.0-1.5) (0.0-2.0))
+19.32((x-0.0) (x-1.0) (x-1.5) (x-2.0)/ (0.5-0.0) (0.5-1.0) (0.5-1.5) (0.5-2.0))
+90.62((x-0.0) (x-0.5) (x-1.5) (x-2.0)/ (1.0-0.0) (1.0-0.5) (1.0-1.5) (1.0-2.0))
+175.71((x-0.0) (x-0.5) (x-1.0) (x-2.0)/ (1.5-0.0) (1.5-0.5) (1.5-1.0) (1.5-2.0))
+407.11((x-0.0) (x-0.5) (x-1.0) (x-1.5)/ (2.0-0.0) (2.0-0.5) (2.0-1.0) (2.0-1.5))

Y(2.5) = 0.00((2.5-0.5) (2.5-1.0) (2.5-1.5) (2.5-2.0)/ (0.0-0.5) (0.0-1.0) (0.0-1.5) (0.0-2.0))
+19.32((2.5-0.0) (2.5-1.0) (2.5-1.5) (2.5-2.0)/ (0.5-0.0) (0.5-1.0) (0.5-1.5) (0.5-2.0))
+90.62((2.5-0.0) (2.5-0.5) (2.5-1.5) (2.5-2.0)/ (1.0-0.0) (1.0-0.5) (1.0-1.5) (1.0-2.0))
+175.71((2.5-0.0) (2.5-0.5) (2.5-1.0) (2.5-2.0)/ (1.5-0.0) (1.5-0.5) (1.5-1.0) (1.5-2.0))
+407.11((2.5-0.0) (2.5-0.5) (2.5-1.0) (2.5-1.5)/ (2.0-0.0) (2.0-0.5) (2.0-1.0) (2.0-1.5))
=1037.478125

Therefore, the answer is E.

Q 10 Answer: E

P3(x) = Y(x) = y0L0(x) + y1L1(x) + y2L2(x) + y3L3(x) + y4L4(x)
f(x) = √x
f(x0) =f(2) = √2
f(x1) =f(3) = √3
f(x2) =f(7) = √7

x y
2 √2
√3-√2/3-2 = 0.317837

3 √3
0.18274-0.317837/7-2 = -0.0270194
√7-√3/7-2 = 0.18274
7 √7

y(x) = √2 + 0.317837(x-2) + (-0.0270194)(x-2)(x-3)
y(2.5) = √2 + 0.317837(2.5-2) + (-0.0270194)(2.5-2)(2.5-3)
= 1.579886912
Therefore, the answer is E.