Math Assignment

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Q1. Answer A - 1

Inputting this logical equation into MATLAB, the value of X = 1.

This is so, X=(1~=0) evaluates to true because 1 does not equal 0. The second and third statements are false as they claim 2 is greater than 2 and also 7 is less than 4. This gives us true given false and false.

This evaluates to true, leaving X=1.

Q2. Answer E - none of the above

r = [-7.7417,-0.2583]

Q3. Answer E - none of these

e = 17.9876

Q5. Answer C - 1.15630, 1.10167

In order to find the parameters, we use the following formula with :

x = Tk , y = Sk

a = nSxy − SxSy / nSxx − (Sx)^2

b = SxxSy − SxySx / nSxx − (Sx)^2

Next, we evaluate the variables with the data :

Sxy = (0)(1.15) + (1)(2.32) + (2)(3.32) + (3)(4.53) + (4)(5.65) + (5)(6.97) + (6)(8.02) + (7)(9.23) = 192.73

Sx = 1 + 2 + 3 + 4 + 5 + 6 + 7 = 28

Sy = 1.15 + 2.32 + 3.32 + 4.53 + 5.65 + 6.97 + 8.02 + 9.23 = 41.19

$Sx^2 = \sum(x^2) = 140$

$a = 1.1563$

$b = 1.10167$

Q6. Answe E - none of the above

In order to find the parameters in a least squares sense for the function

$f(x) = \alpha e^{\beta x}$, we must take the natural log of both sides to change it to linear form.

we get:

$\ln(y) = \ln(\alpha e^{\beta x}) = \ln(\alpha) + \ln(e\beta x) = \beta x + \ln(\alpha)$

let $\ln(y) = Y$, $x = X$, $\ln(\alpha) = a0$ and $\beta = a1$.

same formula as for a normal linear least squares regression :

$\beta = nSxy - SxSy / nSxx - (Sx)^2$

$\alpha = SxxSy - SxySx / nSxx - (Sx)^2$

We then evaluate the variables to be used in the formulas :

$Sx = 1 + 3 + 6 + 9 + 15 = 34$

$Sy = \ln(5.12) + \ln(3) + \ln(2.48) + \ln(2.34) + \ln(2.18) = 5.2695$

$Sxy = (1)(\ln(5.12)) + (3)(\ln(3)) + (6)(\ln(2.48)) + (9)(\ln(2.34)) + (15)(\ln(2.18)) = 29.7198$

$$Sxx = \sum(x^2) = 352$$

Substituting into the formulae we get :

$a1 = (5)(29.7198) - (34)(5.2695) / (5)(352) - (34)^2 = -0.050603$

$a0 = (352)(5.2695) − (29.7198)(34) / (5)(352) − (34)^2 = 1.397998$

But since ln (α) = a0 , then a = e^a0 which gives us :

$α = e^{1.397998} = 4.047089$

Q7. Answer A - 1.9681, 3.1468

let Y = y , X = 1/x , a1 = β , and a0 = α.

substituting values into the formula :

$SX = \sum X = 1.6778$

$SY = \sum Y = 15.12$

$SXY = \sum XY = 6.9386$

$SXX = \sum (X)^2 = 1.55679$

Then filling into the formulae:

$a1 = (5)(6.9386) − (1.6778)(15.12) / (5)(1.556789) − (1.6778)^2 = 3.1468 = β$

$a0 = (1.55679)(15.12) − (6.9386)(1.6778) / (5)(1.155679) − (1.6778)^2 = 1.9681 = α$

Q8. Answer D - -1.19004

given -

f(x) = log4(cos(x))

x0 = 0.5, x1 = 1, x2 = 1.5

calculating the outputs of the initial values to the function :

F[x0] = log4 (cos(0.5)) = −0.094197

F[x1] = log4 (cos(1)) = −0.44408

$F[x2] = \log4 (\cos(1.5)) = -1.91069$

calculating the divided differences :

$f[xi, xi+1] = f[xi+1] - f[xi] / xi+1 - xi$

$f[xi, xi+1, xi+2] = f[xi+1, xi+2] - f[xi,xi+1] / xi+2 - xi$

$F[X0,X1] = F[X1] - F[X0] / X1 - X0 = -0.44408 - (-0.094197) / 1 - 0.5 = -0.699766$

$F[X1,X2] = F[X2] - F[X1] / X2 - X1 = -1.91064 - (-0.44408) / 1.5 - 1 = -2.93312$

$F[X0, X1, X2] = F[X1,X2] - F[X0, X1] / X2 - X0 = -2.93312 - (-0.699766) / 1.5 - 0.5 = -2.233354$

interpolate for the point X=1.3 :

$P2(X) = F[X0] + F[X0,X1](X - X0) + F[X0,X1, X2](X - X0)(X - X1)$

$= -0.094197 + (-0.699766)(X - 0.5) + (-2.233354)(X - 0.5)(X - 1)$

$\therefore P2(X = 1.3)$

$= -0.094197 + (-0.699766)(X - 0.5) + (-2.233354)(1.3 - 0.5)(1.3 - 1)$

$= -1.19001476 \approx -1.19004$

Q9. Answer E - none of the above

using the Lagrange method :

The given function : $f(x) = x^3\log2(x)$

initial values: $x0 = 2$, $x1 = 3$, $x2 = 7$

using the formula:

$f(x) = (y1) (x - x1)(x - x2) / (x0 - x1)(x0 - x2) + (y2) (x - x0)(x - x2) / (x1 - x0)(x1 - x2) +$

$(y3)\ (x - x0)(x - x1) / (x2 - x0)(x1 - x2)$

To get y, we substitute the following -

$y1 = (2)^3\log2(2) = 8$

$y2 = (3)^3\log2(3) = 42.79398752$

$y3 = (7)^3\log2(7) = 962.9227383$

after substitution -

$f(x) = (8)\ (x - 3)(x - 7) / (2 - 3)(2 - 7) + (42.79 \ldots)\ (x - 2)(x - 7) / (3 - 2)(3 - 7) + (962.922 \ldots)\ (x - 2)(x - 3) / (7 - 2)(7 - 3)$

evaluating at x=5 :

$f(5) = (8)\ (5 - 2)(5 - 7) / (-1)(-5) + (42.7..)\ (5 - 2)(5 - 7) / (1)(-4) + (962.9..)\ (5 - 2)(5 - 3) / (5)(4)$

$= 346.6678$