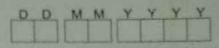
Amignment - 02)a Solve 9'(x)=3x+4 , y(0)=1 then find y(0,2) with h=0.2 asing modified Euler's Zuthod. As given yo=1, x0=0, h=0.2, f(x,y)=3x+y x1=x0+h=0+0.2=0.2 I stage we have below's formula $y^{(0)} = y_0 + h. f(x_0, y_0)$ = 1 + 0.2(0.5)² = 1 + 0.2(0.5)² We have MEF y(0) - yo + h/2 (f(xo, yo) + f(xo, yo)) 2 1 + 0.1 (0.5+ (3(0.2)+ 1(1.40)) = 1.1650 4(1) = 40+1/2 (f(x0/40) + f(x1, y10)) = 1 + 0.1 (0.5 + (3(0.2)+ \frac{1}{2}(1.1650)) 21.1682

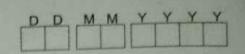
y = y + h/2 (f(x, y)) + f(x, y)) = (+0.1 (0.5 + (3(0.2) + \frac{1}{2} (1.1682)) = 1.1684

y,3) = yot W2 (f(xo, yo) + f(x, y(21)) = 1 + 0.1 (0.5 + (3(0.2)+ \frac{1}{2} (1.1684)) y,3) = 1.1684



6. Apply Runge-Kutta nuthod & fourth order to find on approximate value of y when x=0.2 given that dy = x+y and yet, when x=0. ≥ given dy = f(x(y), y=1, x(=0 Xo+h = 0.2 ! = XH h=0.2-0=0.2 By R-KM 40 (x0+h)= 40+h/6 (K,+2K,+2K3+K4) -70 K = hf (xo, yo) = 0.2 (0+1) K1 = 0.2 "K2 = hf (x0+47, 40+K1/2) : -0.2.f(0+0.1, 1+0.1 =0.2 (0.1+1.1) K2 = 0.24 Kz : hf (xoth/2, yot Kzlz) 20-2 + (0.1, 1+0.12) = 0.2 (0.1+1.12) Kz = 0.244 Ky=hf(xo+h, Yo+K3) = 0.2 f(0.2, 1.244) 20.2 (0.2+ 1.244) Ky 20.2888 y(0+0.2) = 1 + /6 (0.2+2x0.24+2x0.244+0.2888)

4(0.2) - 1.2428



C. Given dy -xy+y², y(0)=1, y(0.1)=1.1169, y(0-2)=1.2773, y(0.3)=1.5049 (empute y(0.4) wing Milne's Method.

Given		
x	9	y'= 37 = xy+42
0	1	
0.1	1.1169	1-3592
0.2	1.2773	1.8870
0.3	1-5049	2,4162

y(p) = y0 + 4h (2y1-42+2y3)

= 1 +4(0·1) [2×1.3592-1.8870+0.60,7162)

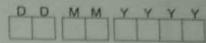
4(P) = 1.8352.

y'(1) = >4/1020 = 0.4 × 1.8352 + 1.83532 y'(1) = 0.4 × 1.8352 + 1.83532

y(4) = 42 + h/3 (42 + 442 + 44) = 1.2773 + 0.1/3 (1.8870 + 4 (2.7162) + 4.1020) y(6) = 1.8391

y'(4) = x(444 + 42 (c) = 0.4 x1.8391+1.8391² y'(4) = H-1179

y= 42+ h/3 [4] + 443' + 44 (6)] = 1.2+73 + 0.1 (1.8870 + 4(2.7)62) + 4.1179 VEMANA IT



y(Ci) = 1.8396 y ((c)) = >(q y ((,)) + y 2 ((,)) = 0.4 × 1.8396 + 1.8396² y ((c)) = 4.1200 y((2) = 42 + h13 (42 + 443 + 44 (62)) 41(12) = 1.8397 3 10.1 [1.8870+4(9,7162)+4.1200] y (((2) = X4 y ((2) + y 2((2)) yu (C) = 0.4 K1.8397 +1.83972 = 4.1204 4(13) = 42 + h/3 (42) + 443 + 4(22) = 1,2773+0.1 (1.8870+ h(2.7162)+4.1204) 4(13)=1.8397 2.a. Employ Taylor's series method to obtain approx, value of y at x = 0.2 for the differential equation dyax = 2y + 3ex, y(0) zo. As JSE of y(x) is given by

y(x): y(x) +(x-x)y'(x) + (x-x)2 y'(x) + (x-x)3y''(x)

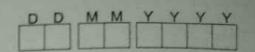
2! 3! -70 y(0)=0 => y(20)=90 x0=0, y0=0 14 - 94+3ex y' = 2y + 3ex VEMANA IT

	y'm = 2(0) +3e° = 10 + 3 = 3
	3x = 2y+3ex
	Dill write x
	y" = 24' + 3ex
	11 1 2 1 2 1 (0)
	y"(0) = 2 (3) + 3c°
1 1 40	4"0 = 9 0 1 1 = 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	y" = 29' +3cx
	Dill wat re
	y"= 9y" +3c2
	4"(0) = 24"(0) + 3 c x(0)
	"" a road 1 2 ""
	y"10)= 29
THAT!	forom (gr 0)
	y(0.3) = 0 + (0.2-0) 3+ (0.2-0) 3+ (0.2-0) 30.
	2 6
- sutonta	= 0 + 0·6 + 0·18 + 0.028
· 中国第4	4(02) = 0.8080.
	on a
	y(0,2)=0+(0.2-0)3+(0.2-0)9
Carle Lie X	2
0.5	= 0 +0.6 + 0.18
	4(0.2)=0.78
6.	Using the Runge-Kirtha reethod of bounth order, solve
	dy = y2x2 with y(0)=1 at x20.2.
	$\frac{34 = 4^2 x^2}{5^2 + x^2}$ with $\frac{4(0) = 1}{2}$ at $\frac{20 \cdot 2}{2}$.

Stage I, K, = L+ (>6, 40) =0.2+(011) = 0.2 (12+02) K= 0:2 $K_2 = h f(x_0 + h/2, y_0 + K_1/2)$ $K_2 = 0.2 f(0 + 0.1, 1 + 0.1)$ $K_2 = 0.2 \left(\frac{1.1^2 - 0.1^2}{1.1^2 + 0.1^2}\right)$ = 0.2 (0.9836) K220.1967 K2 = h f(x0+h/2, y0+ K2/2) 1.09842 + 0.12 = 0.2 (0.9836) K2 20.1967 Ke = hf (xo + h, Yo f Kz = 0.2 f (0.2, 1+0.1967) = 0.2 (1.1967-0.22) 1.19672+0.22) 20.2 (0,945 F) Ky=0.1891

By RKM =) y(x0+h) = y0 + { (K, +2K2+2K3+K4) y(0+0.2) = 1 + { (0:2+2×0.1967+2×0.1967+0.1891) y(0.2) = 1.1960

VEMANAIT



a Write the Mathematical tool cody to solve the differential capation dy =2y=3ex with y(0)=0 wing the Jaylon's series method at x=0.1(0,1)0.3. forom numpy import array, zeros, exp dy taylon (doir, x,y, xstop, h); X=(7 Y=[] X. append(x) Y-append (y) while x x x Shop: D=deriv(2,4) ft=1.0 for ; in range (3): H= M*h/(3+1) y=y+0[;]+4 X. append (x) 4. append (y) return array (X), array (Y) def deriv (144); D=Zeros ((4,1)) 0607= [2*4(07+3*exp(2))] D(1)= [4*4 [0]+9* exp (70)] p[2]=[8 x y (0) + 21 x (xp(x)) D(3)2 (T6#4(0) +45 * BO(X)) orubura D

VEMANA IT

220.0 x Stop = 0.3 y = array (co.03) X, Y= taylon (deriv , x, y, xSfoop, h) Printl" The required valuer on: at x=160.24, y=1.0.54, x=1.0.2f, y=1.0.5f, x=1/0.21, y=1/0.51, ·(X (0) Y(0), X(1), Y(1), x(27, y(37, x(37 y(3))) 3.a. By Taylon's series method, find the value of y at x=0.1 and Any Given y(0)=1 =7 y(x0)=y0 =7 y0=1, x0=0. y1=(x2y=1) y (x0) = (x0 40-1) 4 (0)= (0:1-1) 4 (0) = -1 y1 = (x2y-1) y" = 2xy + x2y1 y"(x0) = 2 x0 y0 + x2 y (x0) y"(0) = 2.0.1 + 0°(-1)

yu (0) = 0

D	D	M	M	Y	Y	Y	Y
	_			-		100	

 $y'' = 2xy + x^2y'$ Diff whi >($y''' = 2y + 2xy' + 2xy' + x^2y''$ $y'''(x_0) = 2y_0 + 2x_0y'(x_0) + 2x_0y'(x_0) + x^2$ $y'''(x_0) = 2y_0 + 2x_0y'(x_0) + 2x_0y'(x_0) + x^2$ $y'''(x_0) = 2$ $y'''(x_0) = 2$

By JSM y(x)= y(x) + (x-X)y'(x) + (x-x) y (x) + (xx) y (x)-2! 31 -10

from Ear (01-0)-1+(0.1-0)20+(0.1-0)32 y(0.1)=1+(0.1-0)-1+(0.1-0)20+(0.1-0)32

y(0·1)=1 +(-0·1) + (0.005)+(0.0003) y(0·1)=0.9053.

b. Using the Runge-Kutta mutual of fourth order, find y (0.1)

given that dy/dx = 3ex + 24, y(0)=0, talking hzo.1

A given dy = 3ex + 24, y(0)=0, talking hzo.1

f(x, y0)= 3ex+2y

x, = h f (>co, yo)

 $K_1 = 0.3$ $K_2 = h f (x_0 + h/2, y_0 + K_1(2))$ = 0.1 f (0.05, 0.15)

K220-3454

12=hf(x0+h/2, y0+k2/2) =0.1 f(0.05, 0.1577) K2=0.3469 Ky=hf(x0+h, y0+K3) =0.1 f(0.10, 0.3489) Ku=0.4015

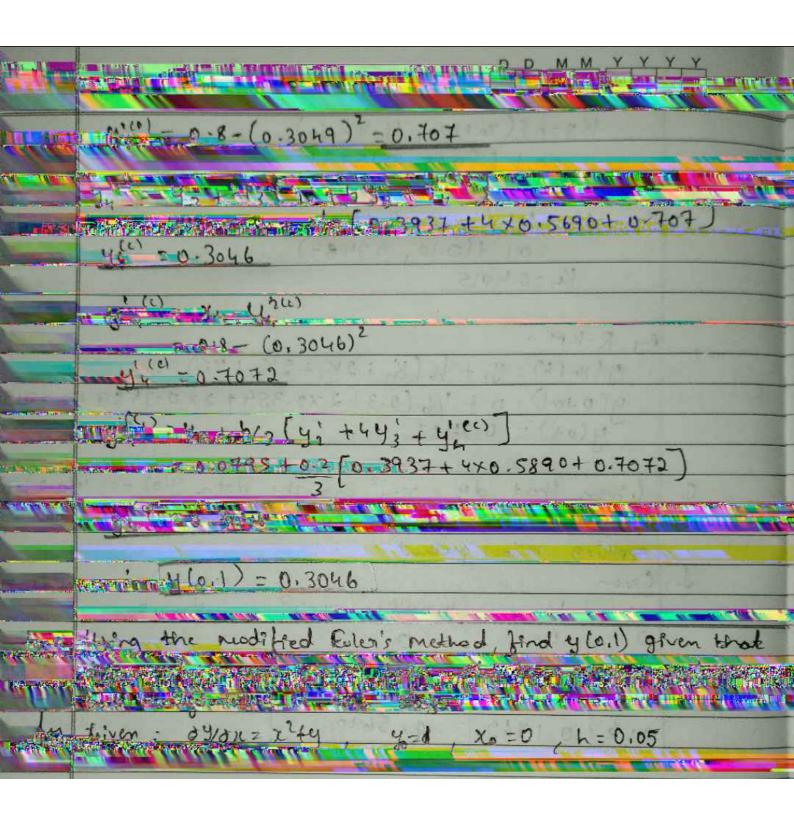
By R-KM y(x6+6)= y0+ 1/6 (K, +2K2+2K3+K4) y(0+0-1)=0+1/6 (0.3+2×0.354+2×0.3469+0.4015) y(0-1)=0.3487.

C. Given that dy = xcy2 and the data ylo) =0, ylo.2)=0.02, ylo.4) = 0.0795, 1xylo.6)=0.1762. compute y at x=0.8 by applying milne's nuthod.

By milne's PM y(P) = y0 + 46/3 (24', -42' + 243') = 0 + 4(0.2) (2(0.1991) - 0.3937 + 2(0.5690))

yyp) = 0.3049.

y 4 = >4- 94



ga. Continue Stage I'-Years = In + hf(2, y) y, = yo + hf(xo, yo) = 1+0.5(02+1)=1.05 By readified EM y" = yo + h [f(xo, yo) + f (x, y")] yi'= 1:05131 y = y + h (f(x0, y0) + f(x, y1))] y(2) = 1.05135 y'3) = Yo th (f(xw, yo) + f(x, y, (v)) y(3) = 1.05135. Stage #: - Cet Xo=0.05, Yo=1.05135, h=0.05 fcx,y1=x2+y, >4=Xoth = 0.05+0.05=0.1 by Eulor's Method Yntl= Ynth f(xn, yn). y1 = yoth & (xo, yo) = 1.05135+ 0.05 f(0.0512+1.05935) 4 (0) 2 1. 10404.

By MEM.

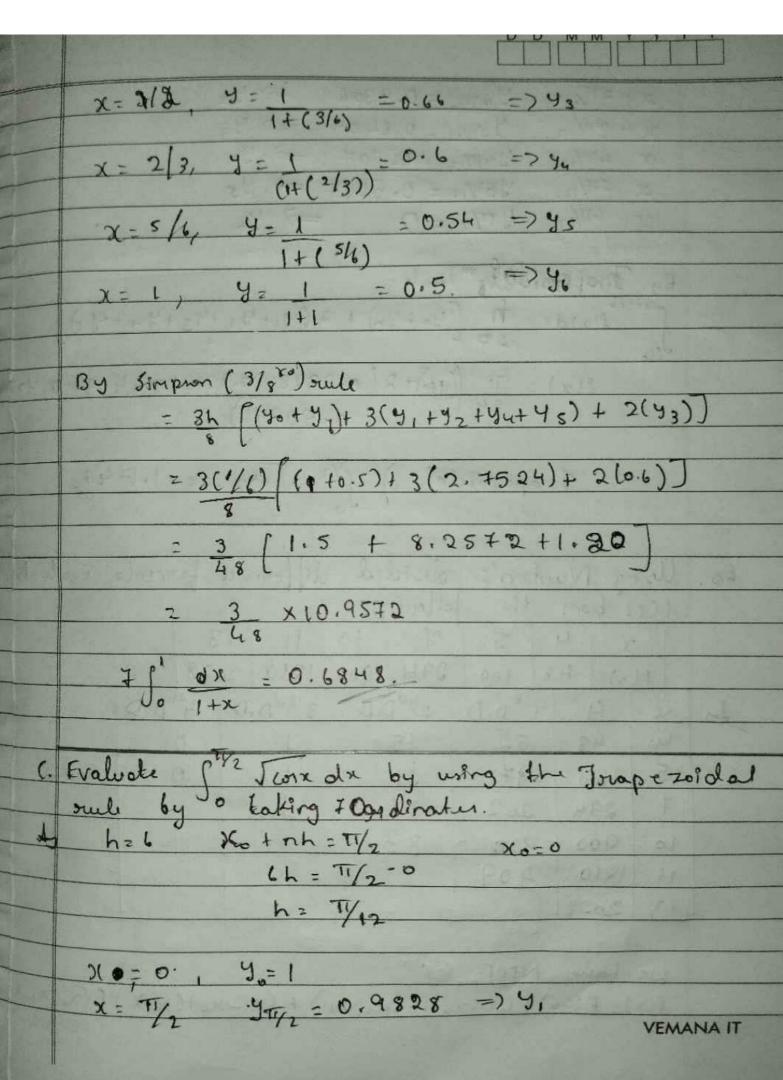
y (1) = yo + h [f(xw, yo) + f(x, y, 10)] = 1.05135 + (0.05) [1.05385 + [(0.1)2 + 1.10404)] y 11 = 1.10555 y(2) = yo + h (f(xq, yo) + f(xq, y!1)) = 1.05135+(0.05) (1.05385+(10.1)2+1.10555) y(2) = 1,10559. 4(3) = Yo + h [f(xo, yo) + f(x, yi')] = 1.05135+ (0.05) [1.05385+ (10.152+1.10559)] · . y(3) = 1-10559.



Ky = 0.0832 By R-10M, y (x+1)=40+ 40 (K1+2K2+2K3+K4) 2 (2 to 1) -1 + 1/6 (0-1+2x0.0909 +2x0.0909 +0.0832) 40.17 = 1.094 5-Stage, 4=1.0911, X=0.1, h=01 SERVICE OF THE PROPERTY OF THE PARTY OF THE 1.0911-0-1 1-091110-1 the he (xothly, yotky) 2011 10.15 11827 1.1327 + 0.15 AND THE TAX 1 Flo.15 1 11294 Ky=hf(zo+h, Yo+ Kz) £(0.2) (.1677) 1.1677-60.2 Kg = 0.0708 By R-KM; Y(20+A) 2 Yot 1/6 (K,+2K, +2K, +Ky) **VEMANA IT**

1		
	3(02)=1.0911+1/6(0.0832+ 2x0.0766+2x0.0766+0.0708)	
-	My Matternation took write the was do find the solution 1 dy/dx = 1 + 4/2 at 42) taking h=0/2 - Given that y(1)=2	
	Company of the Compan	1
	Alle Kutta (q, xo, h, yo, xn):	
	A COMPAN (X A)	
	$f(x_0+h(x_1-y_0+K_2/x_1))$	(Y)
		ev.
	The state of the s	
	Punge Katta (1+(4/x) + 1,0,2,2,2) VEMANA IT	

5a.	Find y at 20=5 if y(1)=-3, y(3)=9, y(4)=30, y(6)=132 using lagrange's interpolation formula.
A	201346
	y-3 9 30 132 1 x 1 3 = 3 x 2 = 4 x 3 = 6 x = 5
	hur xo=1 3(,=3 \\2=4 \)2=30 \\3=132 \\y=?
	90=5 11=9 12=30
	By Left $y = f(x) = \frac{(x-x_1)(x-x_2)(x-x_3)y_0 + (x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_0)(x_0-x_2)(x_0-x_3)}$ VEMANAIT
	$y = f(x) = \frac{(x-x_1)(x-x_2)(x-x_3)y_0 + (x-x_0)(x_1-x_0)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)}$ (x,-x ₀)(x ₁ -x ₀) (x ₁ -x ₀) VEMANA IT
	(X0-)(10 ×2/10 3)



D	D	M	M	Y	Y	Y	Y

X = 2T/2 ,	Y2T7 = 0.9306	-> Y2
DC = 37/12,	937/12 = 0.8409	=> 43
X2 47/12,	Y 411/12 = 0. 70 7	→ Y4
SCZ 511/12,	Y57/12 = 0.5087	=7 45
D(= 6T/12,	YT/2 = 0	=7 46

By Thepsoidely) sub

Suth fixidx = to [(40+44) + 2 (41+42+43+44+45)]

Su

f(x) = Ti ((10)+2 (0.9828+0.9306+0.8409+0.707+

24 (110)+2 (0.9828+0.9306+0.8409+0.707+

: Inapezoidel of 5 Tosx. dx = 1.1740

6a						divided difference formule, evaluat					
	1 40	8) pro	m	th	follows	9.	Shell.	and and			
		x	4	5	7	10	111	13			
	I f	(x)	28	100	294	900	1210	201	28		
مط	150	1 4	1	rt D.D	2nd [). D	3 8 d D	0.	4th D. D		
	4.	48		52	15	- 3	1		0		
201	5	loo	1	77	21		1		0	JON TO STATE	
	7	294	0	202	27	t Car	- 1	1 5	4 68	11.12	
	10	900	3	10	33		S elect	134	· · ·	Marie Salara	
	11	1910	1	109	1 9 4		Treat.				
	13	2028	1			1		1			

We have NDDF

f(x)= f(x0) + (x-x0) + (x, x1) + (x-x0) (x-x1) + (x0, x1, x2) + VEMANAIT

(x-x0)(x-x1)(x-x2)f(x0,71,2(2, x3)+(x-x0)(x-x1) (x1-X2)(X-X3)+(x1,x12, x13, x4),

= 48+ (8-4)52 + (8-4)(8-5)15+ (8-4)(8-5)(8-4) (15) + (8-4)(8-5)(8-7)(8-10)(0)

48 + 208 + 180 + 12 + 0

b. Evaluate ('] dx using the Jarapezoidal rule by taking to 1+x2 6 alivision.

6h = 1 025

h=1/6

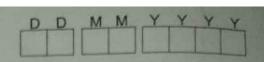
40=1 x = 0Y/6=01973 =>41 4216=019 => 42 x2=2/6, $x_3 = 3/6$, $y_{3/6} = 0.8 = 93$ 24= 216, 9416=016923 = 544 451 = 0.5902 =>42 X5 2 5/6, y, = 0.5 => yc 76=1.

Jrapezoidal rule

[xn+nh f & d > = 1 [(yo+ yn) + 2 (y, + y2 + y3 + y4 + y5)]

xo

 $f(x) = \frac{1}{12} \left[(1+0.5) + 2(0.973+0.9+0.8+0.6923+0.5902) \right]$ $= \frac{1}{12} \left[(1.5 + 2(3.955)) \right]$



$$\int_{0}^{1} \frac{1}{1+x^{2}} = \frac{9.411}{12}$$

$$\int_{0}^{1} \frac{1}{1+x^{2}} = \frac{9.411}{12}$$

C. Evaluate [3] 1 dx by using simpson's 43 rd rule by laking 4 andinatus. 4x+5

Fondinatur.

4 given n+1=+=> n=6

T= 53 1 a=0 6=3

h= b-a/n = 3-0/6 = 1/2 = 0.5

x=0 $y_0=0.2$ y_0 x=0 $y_0=0.1429$ y_1 x=1 $y_1=0.1111$ y_2 x=1 $y_1=0.1111$ y_2 x=1 $y_1=0.0409$ y_2 x=1 $y_1=0.0409$ y_2 x=1 $y_1=0.0409$ $y_2=0.0409$ y_3 x=1 $y_1=0.0409$ $y_2=0.0409$ y_3 x=1 $y_1=0.0409$ $y_2=0.0409$ $y_3=0.0409$ $y_4=0.0409$ $y_5=0.0409$ $y_5=0.0409$

By simpson's (1/3 rd) rule

Iz L (40+41) + 4 (4,+43 +45) + 2(42+44)

2 (0,1111+0,0769)

=0.1667 (0.2588 + 4 (0.3005) + 2 (0.1880))

= 0.1667 (0.2588+1,2020 + 0,3760)

= 0.1667 [1.83**6**8]

I = 0.3062