Jordan University of science and technology
Numerical

Answer the following two questions:

Xi	0	1	2	4	6
F(Xi)	2	5	5	6	1

1- The integration from X=0 to X=6 using trapezoidal-rule result is:

a- 13 b- 19 c- 5312 d- 7013

2- The best value of f(3) using langrage second-order interpolating polynomial equal to:

a- 35/6 b- 16/3 c- 30/7 d- 35/8

3- Given f(x) = xsin(2x), the best guesses for XL and Xu to locate the second local positive maximum for f(x) using golden-section method:

a-XL=1.5π, Xu=1.75π b-XL=π, Xu=1.5π c-XL=1.25π, Xu=1.5π d-XL=0.75π, Xu=π

4- Five data points (0,1), (1,1.5), (2,2), (3,9), (4,8) are used to integrate from x=0 to x=4, using multiple application trapezoidal rule, the best additional point to enhance the accuracy would be at x equals:

a- 0.5 b- 1.5 c- 2.5 d- 3.5

5- The quadratic interpolation optimization method was used and generated the following three successive extreme points (0,3), (2,4) and (1,15) to generate (3,1) as an extreme point, the next iteration will locate extreme at:

a- 37/22 b- 3/4 c- 41/14 d- 7/6

6- The first derivative was estimated at a certain point using backward divided difference with 0(h) scheme and centered divided difference with $0(h^2)$ scheme to be 3.5 and 4 respectively, then the first derivative using forward divided difference with 0(h) is:

a- 4.5 b- 4 c- 2.5 d- 3

7- The secant method formula for finding the square root of a real number R from the equation $x^2 - \mathrm{R} = 0$ is:

a- $\frac{xi\ xi{-}1+R}{xi+xi{-}1}$ b- $\frac{xi\ xi{-}1}{xi+xi{-}1}$ c- $\frac{2xi^2+xi\ xi{-}1-R}{xi+xi{-}1}$ d- $1/2(xi + \frac{R}{2})$

Given $\frac{dy}{dx}$ = x- 2y with y(0)= 0, answer question 8 and 9:

8- The value of y(72) using Huen's method with h=1 equals to:

a- 36 b- 33.25 c- 46.5 d- 32

9- The value of y(72) using midpoint method with h=1 equals to:

a- 36 b- 33.25 c- 46.5 d- 32

10- in which operation is the relative error introduced by round-off error the most significant:

a- 135.4+.03652 b- 200-$\sqrt{39998}$ c- 132.1 X 1.981 d- 200+$\sqrt{39998}$

11- Simpsons 1/3 rule applied to the computation of the integral $I = \int_0^2 \sqrt{1+x^2}\, dx$ leads to:

a- $I \sim \frac{1+2\sqrt{2}+\sqrt{5}}{2}$ b- $I \sim \frac{1+4\sqrt{2}+\sqrt{5}}{3}$ c- $I \sim \frac{1+4\sqrt{2}+\sqrt{5}}{2}$ d- $I \sim \frac{1+\sqrt{2}+\sqrt{5}}{3}$

12- which of the following g(x) will lead to a fixed point iterative scheme $xi + 1 = g(xi)$ That will converge the positive root of $f(x) = x^2 - 3/x$ when started from an initial guess close enough:

a- $g(x) = x + x^3 - 3$ b- $g(x) = 3/x^2$ c- $g(x) = \sqrt{\frac{3}{x}}$ d- $g(x) = \frac{x}{x^2-3}$

13- Given $3\frac{dy}{dx} + \sqrt{y} = e^{0.1x}$, y(0.3)= 5 and using a step size of h= 0.3, the best estimate of $\frac{dy}{dx}(0.9)$ using Euler's method is most nearly:

a- -0.37319 b- -0.36288 c- -0.35381 d- -0.34341

14- using one step Runge-kutta 4th order method to find y(2) for the system $\frac{dy}{dx} = x + y$, y(0) = 0 :

a- 12/3 b- 14/3 c- 15/3 d- none

15- On most computers, the computations of $\sqrt[n]{a}$ ($a \geq 0.0$) is based on Newton-Raphson method of root location the iteration can be written in form of :

a- $xi+1 = n/2(xi + \frac{a}{xi})$

b- $xi+1 = \frac{xi+na}{nxi^{n-1}}$

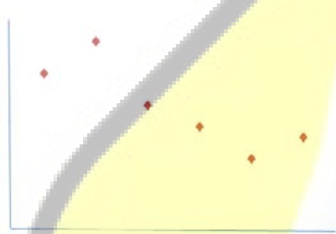
c- $xi+1 = 1/2(nxi - \frac{a}{xi})$

d- $xi+1 = \frac{(n-1)xi^{n}+a}{nxi^{n-1}}$

16- Given $f(x) = ax + \frac{b}{x}$ has real root where a and b are real nonzero constant the n:

a- $f(x)$ has no real extremes b- $f(x)$ has two real extremes c- ab<0 d- a and c

17- A robot needs to follow a path that passes through six points as shown, to find the shortest path that is also smooth you would recommended which of the following:



a- pass 5^{th} order polynomial through the data

b- pass linear spline

c- pass quadratic spline

d- regress the data to 2^{nd} order

18- If $P = \frac{Z}{A+Z}$, what is the value of A based on the table below:

Z	1.2	1.6	2.4	4
P	60	40	20	10

19- A student finds the numerical value of $\frac{dy}{dx}(e^{x}) = 20.22$ at x=3, using step size of h=0.2, which of the following method did the student use to conduct the differentiation:

a- Backward divided difference

b- calculus, that is exact

c- central divided difference

d- forward divided difference

20- using optimization to solve $-\frac{dc}{dt} = kc^{n}$ .....etc

Good luck