BIRZEIT UNIVERSITY

Mathematics Department

Math 330

Final Exam 2nd Semester 20/21

Student name: …… ID no.: …… sec……..

Circle your final Answer, You should show how you get the answer, we will only grade the supported answer, Each problem worth 3points

1) Using four digits arithmetic and rounding, Find the value of

$$\frac{7}{17}+\frac{81}{13}+\frac{801}{19}$$

Answer=

2) When using the bisection method to estimate the solution of the equation $f(x)=0$ on the interval [4,6], find the number of iterations needed to get accuracy 10^{-5}.

Answer=

3) Use the secant method with $p_0=1$, $p_1=1.5$ to estimate the solution of the equation $x^5=x+4$, Find the next iteration.

Answer=

(4) Find the repulsive fixed point of $g(x) = \frac{10}{x} + 3$

Answer=

5) Find the order of convergence of the following sequence of numbers that converges to p=1, Prove your answer numerically

$$p_0 = 1.2000000000$$
$$p_1 = 1.006060606$$
$$p_2 = 1.000006087$$
$$p_3 = 1.000000000$$

Answer=

6) When estimating the roots of the function $f(x) = (x+3)^3(x-1)$ using Newton Method, find the asymptotic error constant A for $p = 1$

Answer=

7) Find the point on the parabola $y = x^3$ that is closest to the point (1, 2) with two digits accuracy of the x coordinate.

Answer=

8) Using a table, Find $f\ [1.3,\ 2.4,\ 3.6]\ where\ f(x) =\ x^2$

Answer=

9) Find $L_{3,2}(5)$ using the nodes

$$x_0 = 3\ , x_1 = 4, x_2 = 6\ , x_3 = 8$$

Answer=

10) Find the cost of evaluating $p_2(x)$, for a specific x, where $p_2(x)$ is the Lagrange interpolating polynomial

.

Answer=

11) Find the best upper bound for the error when using Newton polynomial $p_3(x)$to estimate $f(x) = ln(x+1)$ in the interval [0.1,0.4] and using uniform partition.

Answer=

12) If the following is a cubic spline over [0, 2]

$$S(x) = \begin{cases} -2x^3 + 2x^2 + ax + 1\ , & 0 \le x \le 1 \\ 7(x-1)^3 - 4(x-1)^2 + b\,(x-1) + 1\ , & 1 < x \le 2 \end{cases}$$

Find a and b

Answer=

13)- Consider the following formula

$$f''(x_0) = \frac{f_3 - 4f_0 + 3f_{-1}}{6h^2} - \frac{2hf'''(c)}{3}$$

Find the optimal h

Answer=

(14) Approximate $\int_{-1}^{1} x^2\, e^{x^2} dx$
Using Simpson's rule

Answer=

15)- Estimate $f'(4)$,and $f''(4)$ using central difference formulas of order $o(h^2)$ for the data (0,1), (2,4), (4,6), (6,9)

Answer=

16)- Consider the quadrature formula

$$\int_{-6}^{6} f(x)dx \cong Af(-6) + Bf(6)$$

If the degree of precession is 1, Find A, B

Answer=

17) - Consider the quadrature formula

$$\int_{-1}^{1} f(x)dx \cong \frac{4}{5} f\left(-\frac{1}{2}\right) + \frac{6}{5} f\left(\frac{1}{3}\right)$$

If the degree of precession is 1, Find the truncation error.

Answer=

Good Luck