ID NO.

King Fahd University of Petroleum and Minerals
Department of Mathematics,

Math 371 Exam I, Summer Semester (223)
Net Time Allowed: 90 minutes
July 12, 2023. 7:00 pm

Name:

ID No.:

Section No.:

Please:

1. Write clearly with a pen or dark pencil in the designed area for each question.
2. Write your ID NO in each page in the right corner inside the box.
3. Fill your info clearly.
4. Show all your steps. No credit will be given to wrong steps.
5. If more space needed, use last page but state clearly in the question page
6. Mobile phones and smart devices are NOT allowed in this exam.
7. Set your calculator to RADIAN
8. Use 4 decimal places in your calculations.

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Q1. a) Find the second Taylor polynomial $P_2(x)$ for $f(x) = e^x \cos(x)$ about $x_0 = 0$.

b) Find the bound error in approximating $\int_0^{0.5} f(x)dx$ by $\int_0^{0.5} P_2(x)dx$

Q2. Suppose p^* must approximate p with relative error at most 10^{-3}. Find the largest interval in which p^* must lie.

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Q3. Use three-digit chopping arithmetic to perform the following calculations.

$$-10\pi + 6e - \frac{3}{62}$$

Q4. Use Bisection method to find p_3 for $f(x) = \cos(x) - \frac{1}{4}e^x$ on [0, 1]

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Q5. Show that $g(x) = \frac{x^2+1}{4}$ has a unique fixed point in [-1, 1].

Q6. Find the second iteration of Newton's method to approximate the *x*-coordinate of the intersection point of the graphs $y = x^2 - 4x$ and $y = \ln x - 4$. Use $p_0 = 1$

Q7. Let $P_3(x)$ be the Lagrange interpolation polynomial for the data: $(0,0), (0.5, y), (1,3)$, and $(2,2)$. If the coefficient of x^3 in $P_3(x)$ is 6, find y.

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Q8. Use Newton Divided -difference formula to construct interpolating polynomial of degree three for the following data: $(1,2), (2,9), (3,28), and\ (4,65)$.