MTH 4422 Midterm Study Guide

Pat Rossi   Name _____

Instructions.   Answer the following questions thoroughly.

1. Explain the idea behind Newton's Method for solving the equation $f(x) = 0$, using the Taylor's Series approach.

2. Explain the idea behind Newton's Method for solving the equation $f(x) = 0$, using the Geometric approach.

3. Explain how and why the Bisection Algorithm (for solving $f(x) = 0$) works.

4. Explain how and why the Fixed Point Algorithm (for solving $f(p) = p$) works.

5. Explain how LaGrange Polynomials are constructed to approximate the function whose data points include $(x_0, f(x_0)), (x_1, f(x_1)), \ldots, (x_n, f(x_n))$, and explain why this works.

6. Describe the Trapezoidal Method for integration, and explain why it works.

7. Describe Simpson's Method for approximating $\int_a^b f(x)\, dx$, and explain why it works.

8. Given the data points $(-1, -2), (1, 2), (2, 7)$, compute the LaGrange Polynomial that agrees with the data points.

   We have 3 data points, so we should have a polynomial of degree 2.

9. Given the data points $(-2, -46), (-1, -14), (0, -4), (1, 2), (2, 22)$ compute the LaGrange Polynomial that agrees with the data points.

10. With reference to the preceding exercise, we had 5 data points and yet the LaGrange Polynomial was only of degree 3. (We would expect that the LaGrange Polynomial that fits all **five** data points would have degree 4.) How can we explain this?