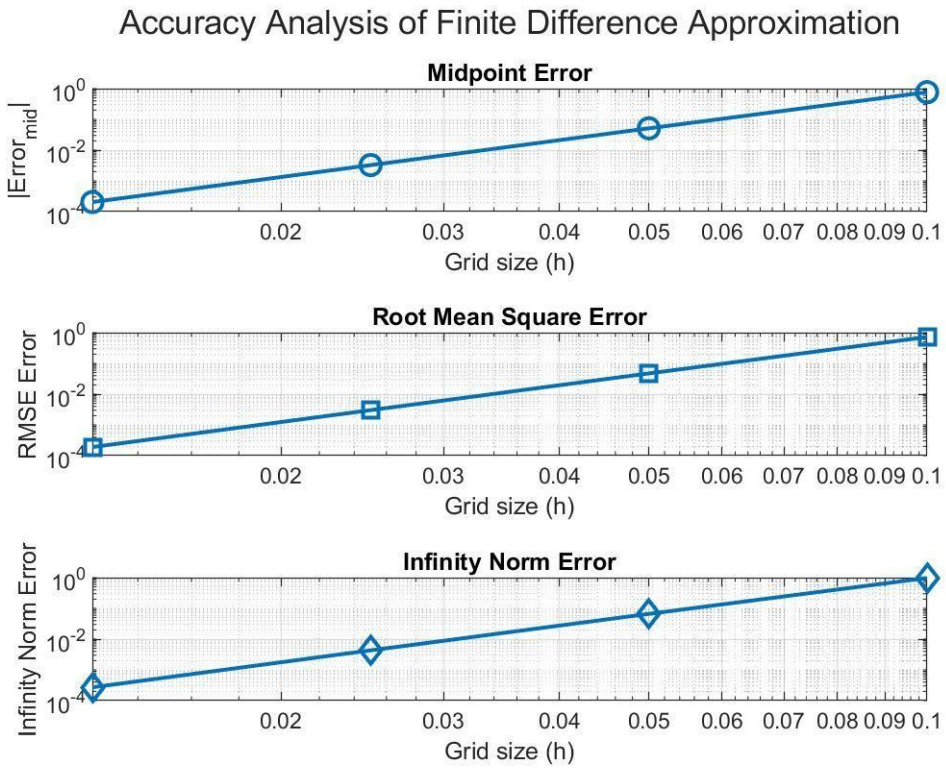
Assignment 3:

I have corrected my mistakes in my error, and here are the updated results, and explanation of the results:

Results for main.m:

```
Midpoint: Fit is |E| = 3.9596*h + (8.8687)
RMSE: Fit is |E| = 3.9639*h + (8.8112)
Infinity: Fit is |E| = 3.9389*h + (9.0657)
```



Result Explanation:

The fact that the order of accuracy is the same regardless of the error metric used is a characteristic of the finite difference method and reflects certain underlying mathematical properties of the method.

It can be for the finite difference method which is designed to approximate derivatives of a function by discretizing it into a set of points and using difference equations. This method is typically consistent, which means that as the (h) approaches zero, the approximation converges to the true derivative. This property holds true for all types of errors, whether it's the midpoint error, RMSE error, or the infinity norm error.

Also, different error metrics measure error in slightly different ways, but they are all ultimately based on the same underlying approximation and grid discretization. They are all influenced by the same order of accuracy, which is a fundamental property of the finite difference method.

In summary, the consistency and order of accuracy of the finite difference method are the key factors that lead to the same order of accuracy regardless of the error metric used. The differences in how these error metrics are calculated mainly affect the magnitude and behavior of the errors but do not change the fundamental order of accuracy of the method. This is a desirable property because it means that regardless of the error metric chosen, you can expect similar convergence behavior as you refine the grid.

Midpoint Error:

If the slope is approximately (4), this suggests that the method is (forth)-order accurate. In other words, when we halve the grid size, the error should decrease by a factor of approximately (4).

RMSE Error:

The interpretation is similar to the Midpoint Error.

Infinity Norm Error:

Same interpretation applies here.

Different error metrics (Midpoint Error, RMSE Error, Infinity Norm Error) measure error in different ways. However, when it comes to determining the order of accuracy, they should ideally lead to the same conclusion.

If all three metrics consistently show a slope of approximately (4) in their respective log-log plots, it provides strong evidence that the method is (forth)-order accurate.

However, if different metrics yield significantly different slopes, it might indicate issues with the implementation or numerical instability in the method. In both my results the slopes are similar and lead to the same number.