MACM 316 - Computing Assignment 1

- Read the *Guidelines for Assignments* first.
- Submit a one-page PDF report to Canvas and upload you Matlab scripts (as m-files). Do not use any other file formats.
- Keep in mind that Canvas discussions are open forums.
- You must acknowledge any collaborations/assistance from colleagues, TAs, instructors etc.

Limit of a function

Consider the function

$$f(x) = \frac{1 - \cos(x)}{x}$$

and the limit as x approaches zero:

$$\lim_{x \to 0} f(x).$$

Since there is a division by zero, Matlab cannot compute $f(0)$. Find the limit of $f(x)$ as x approaches zero numerically. You may find the function `logspace` useful: `logspace(a,b,c)` makes a vector of values from `a` to `b` of length `c` then raises 10 to that vector. In this way, `logspace(0,-3,4)` returns the numbers 10^0, 10^{-1}, 10^{-2} and 10^{-3}.

```
logspace(0,-3,4)

ans =

    1.0000    0.1000    0.0100    0.0010
```

What is the order of convergence? You may answer this question analytically or numerically. For full marks, figure out the order of convergence using Taylor series and see if your numerical data agrees with your answer.

What is the smallest value of x you can use? Why might this be the case? Identify sources of round-off error and how they may affect your results.

Your report cannot exceed one page. It should include at least one figure with proper labels. Make sure to choose axis scales appropriate for the data. Discussions should be kept brief and answer all questions asked.