16.901: Homework # 2
Due Date: February 11, 2pm

1. Prove that any *consistent* multi-step method must have a root of $z = 1$ in its stability recurrence relationship. Note: this is a very short three to four line proof.

2. The backwards differentiation algorithms are a class of implicit multi-step methods. The two-step backwards differentiation method has the following form,

$$v^{n+1} - \frac{4}{3}v^n + \frac{1}{3}v^{n-1} = \frac{2}{3}\Delta t f(v^{n+1}, t^{n+1}).$$

   Determine the leading truncation error term. What is the order of accuracy of this method?

3. Prove that the two-step backwards differentiation method is convergent.