Homework 8 – Math 407

1. Use a Taylor expansion around $t = t_{j+1}$ to find the local and global truncation errors for the method $w_{j+1} = w_j + hf(t_{j+1}, w_{j+1})$.

2. Section 6.2: Computer Problems 1(b), 3(b). Repeat both problems with Euler's method, RK4, and the Adams-Bashforth two-step method (using Euler for the first step).

3. Section 6.3: Exercises 3(a,b), 5(b).

4. Let $p(t)$ be the polynomial of degree 2 that interpolates $f(t, y(t))$ at $t = -h, 0, h$. Show that
$$\int_0^h p(t)\,dt = h\left(\frac{5}{12}f_1 + \frac{2}{3}f_0 - \frac{1}{12}f_{-1}\right),$$
where $f_j = f(t_j, y(t_j))$ and $t_j = jh$. What method does this suggest for solving $y' = f(t, y)$?

5. Section 6.6: Exercise 1(b). The exact solution is $y(t) = t - 1 + e^{-t}$.

6. Section 6.6: Exercise 3. Hint: Find a formula for $w_{j+1} - 1$ in terms of $w_j - 1$.