1. Determine the order of the following multi-step methods.

(a)

$$x_n - x_{n-2} = 2hf_{n-1}$$

(b)

$$x_n - x_{n-2} = h \left[ \frac{7}{3} f_{n-1} - \frac{2}{3} f_{n-2} + \frac{1}{3} f_{n-3} \right]$$

(c)

$$x_n - x_{n-1} = h \left[ \frac{3}{8} f_n + \frac{19}{24} f_{n-1} - \frac{5}{24} f_{n-2} + \frac{1}{24} f_{n-3} \right]$$

2. Consider the following initial value problem

$$\frac{dx}{dt} = x^2 + 1$$
$$x(1) = s$$

(a) At time t = 1.5 by how much does the solution at time corresponding to the initial condition s = 1.0 differ from the solution corresponding to the initial condition s = 1.01.

(b) Assuming a numerical method of order 5, and that x(t) < 4 for all  $t \in [1.0, 1.5]$ , how small a step size should one use to ensure a soution satisfying x(1) = 1.0 at time t = 10 is accurate to 1 part in  $10^4$ .