Numerical Methods
MAT/CSC 381
Project 01

Create a report discussing the effects of accumulated roundoff in creating a sequence of numbers. Implement the following using software and express your answers graphically. Show that each method of computing the sequence yields the same numbers in exact arithmetic. Discuss which methods are better and which are worse.

```
M = 30;
n=1:M;
```

% Compute the exact value using a direct formula using vector operations (note the dot operation .^)
```
x = (2/3) .^ (n-1);
```

% Set up initial terms of each sequence to start the recursion
```
p(1) = 1;
q(1) = 1;
q(2) = 2/3;
r(1) = 1;
r(2) = 2/3;
s(1) = 1;
s(2) = 2/3;
```

% Compute the single-step recursion to get the sequence p

```
for k=1:M-1
p(k+1) = 2*p(k)/3;
end
```

% Compute the two-step recursions to get the sequences q, r, s

```
for k=1:M-2
q(k+2) = (7/6)*q(k+1) - (1/3)*q(k);
r(k+2) = (2)*r(k+1) - (8/9)*r(k);
s(k+2) = (8/3)*s(k+1) - (4/3)*s(k);
end
```

% Compute the relative errors for each sequence using vector operations (note the dot operations . /)

```
relp = abs(x - p) ./ x;
relq = abs(x - q) ./ x;
relr = abs(x - r) ./ x;
rels = abs(x - s) ./ x;
end
```