

MATH 128A, SUMMER 2009: PROGRAMMING ASSIGNMENT 1: SOLUTIONS

1. In the file `divided_difference.m`:

```
function y=divided_difference(f, xi)
n=length(xi);
if length(xi) == 1
    y = f(xi(1));
else
    y = (divided_difference(f,xi(2:n)) - divided_difference(f,xi(1:n-1))) / ...
        (xi(n) - xi(1));
end
```

The ellipsis (“...”) above tells MATLAB that the formula continues on the next line.

2. In the command window:

```
>> format long
>> xi = linspace(0, 10, 6);
>> for k=1:6
ai(k) = divided_difference(@cos, xi(1:k));
end
>> actual = cos([pi/3 pi/2 pi]);
>> approx = newton_eval([pi/3 pi/2 pi], ai, xi)

approx =

    0.694083092853490    0.067661126195064   -1.003526514017955

>> abserr = abs(actual - approx)

abserr =

    0.194083092853490    0.067661126195064    0.003526514017955
```

The command “format long” tells MATLAB to print more decimal digits than the default number (5). The last two calculations were printed because they weren’t followed by semicolons.

3.

```
>> xdata = linspace(0, 10);
>> ydata1 = newton_eval(xdata, ai, xi);
>> ydata2 = cos(xdata);
>> plot(xdata, ydata1, xdata, ydata2)
```

These commands produce figure 1 when run in MATLAB and figure 2 when run in Octave. (The figure can be saved to disk using a command like “`print -dpdf pa1graph`”.)

FIGURE 1. Graph from problem 3 (MATLAB)

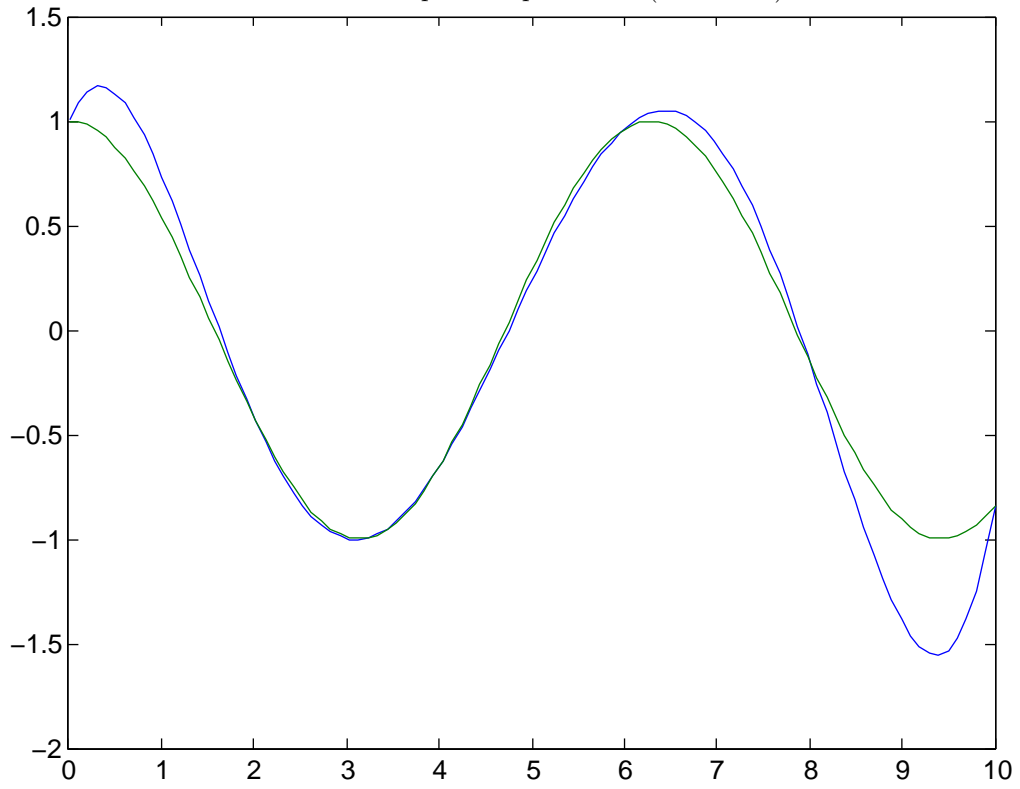


FIGURE 2. Graph from problem 3 (Octave)

