```
%Cory Wolfe

f = @(x) cos(3*x)/(x+1);
I_exact = 0.085473789;
I1 = trap(f,0,pi,1) % Trap n = 1
I2 = trap(f,0,pi,2) % Trap n=2
I12 = 4/3*I2-1/3*I1 % O(h^4)
I4 = trap(f,0,pi,4) % Trap n=4
I24 = 4/3*I4-1/3*I2 % O(h^4)
I124 = 16/15*I24-1/15*I12 % O(h^6)
I8 = trap(f,0,pi,8) % Trap n=8
I48 = 4/3*I8-1/3*I4 % O(h^4)
I248 = 16/15*I48-1/15*I24 % O(h^6)
I1248 = 64/63*I248-1/63*I124 % O(h^8)
[I_f,ea] = romberg(f,0,pi,[],3)
[I_f2,ea2] = romberg(f,0,pi)
error = abs((I_exact-I_f2)/I_exact)*100

I1 =
    1.1915
I2 =
    0.5958
I12 =
    0.3972
I4 =
    0.1523
I24 =
    0.0045
I124 =
   -0.0217
I8 =
    0.0998
I48 =
    0.0823
I248 =
    0.0875
I1248 =
    0.0893
I_f =
    0.0893
ea =
    1.9425
I_f2 =
    0.0855
ea2 =
   8.6560e-09
error =
   2.0101e-07
```

Gauss Quad

```
a = 0; b = pi;
```

```
fd = @(xd) f(((b+a)+(b-a)*xd)/2);
Ig2= (fd(-1/sqrt(3))+fd(1/sqrt(3)))*(b-a)/2
Ig3= (5/9*fd(-sqrt(.6))+8/9*fd(0)+5/9*fd(sqrt(.6))) *(b-a)/2
I_g2 = GaussQuad(f,0,pi,2)
I_g3 = GaussQuad(f,0,pi,3)
I_g8 = GaussQuad(f,0,pi)
```

```
Ig2 =
   -0.2012
Ig3 =
    0.2016
I_g2 =
   -0.2012
I_g3 =
    0.2016
I_g8 =
    0.0855
```

Comparison

```
trap8 = trap(f,0,pi,8);
Etrap8 =  abs((I_exact-trap8)/I_exact)*100;
simp8 = simpson13(f,0,pi,8);
Esimp8 = abs((I_exact-simp8)/I_exact)*100;
Egauss8 = abs((I_exact-I_g8)/I_exact)*100;

fprintf('Method        Result       Error\n')
fprintf('trap n=8      %.4f       %2.2f\n',trap8,Etrap8)
fprintf('S13 n=8       %.4f       %2.2f\n',simp8,Esimp8)
fprintf('Romberg       %.4f       %2.2e\n',I_f2,error)
fprintf('Gauss n=8     %.4f       %2.2e\n',I_g8,Egauss8)
```

```
Method        Result       Error
trap n=8      0.0998       16.79
S13 n=8       0.0823       3.68
Romberg       0.0855       2.01e-07
Gauss n=8     0.0855       5.29e-05
```

Published with MATLAB® R2016b