Question 2

```
clear all;
clc;

format long;

for i=1:7
   N = 10 ^ i;
   fprintf('Difference for N=%i\n', N);
   % difference for (a)
   disp('(a)');
   diff_a = sum_small(N, 1) - sum_large(N, 1);
   single(diff_a)
   double(diff_a)

   % difference for (b)
   disp('(b)');
   diff_a = sum_small(N, 2) - sum_large(N, 2);
   single(diff_a)
   double(diff_a)

   % difference for (c)
   disp('(c)');
   diff_a = sum_small(N, 3) - sum_large(N, 3);
   single(diff_a)
   double(diff_a)

   % difference for (d)
   disp('(d)');
   diff_a = fun_d_small(N) - fun_d_large(N);
   single(diff_a)
   double(diff_a)
end
```

```
Difference for N=10
(a)

ans =

     0


ans =

     0

(b)

ans =

     0
```

```
ans =

     0

(c)

ans =

  -2.2204460e-16


ans =

    -2.220446049250313e-16

(d)

ans =

  -1.1102230e-16


ans =

    -1.110223024625157e-16

Difference for N=100
(a)

ans =

  -8.8817842e-16


ans =

    -8.881784197001252e-16

(b)

ans =

  -6.6613381e-16


ans =

    -6.661338147750939e-16

(c)

ans =
```

```
   6.6613381e-16


ans =

     6.661338147750939e-16

(d)

ans =

   1.1102230e-16


ans =

     1.110223024625157e-16

Difference for N=1000
(a)

ans =

   2.6645353e-15


ans =

     2.664535259100376e-15

(b)

ans =

   1.7763568e-15


ans =

     1.776356839400250e-15

(c)

ans =

  -1.1102230e-15


ans =

    -1.110223024625157e-15

(d)
```

```
ans =

  -1.9984014e-15


ans =

    -1.998401444325282e-15

Difference for N=10000
(a)

ans =

  -3.7303494e-14


ans =

    -3.730349362740526e-14

(b)

ans =

   5.5511151e-15


ans =

     5.551115123125783e-15

(c)

ans =

   3.7747583e-15


ans =

     3.774758283725532e-15

(d)

ans =

  -1.2989609e-14


ans =

    -1.298960938811433e-14
```

```
Difference for N=100000
(a)

ans =

  -7.2830630e-14


ans =

    -7.283063041541027e-14

(b)

ans =

   1.5987212e-14


ans =

     1.598721155460225e-14

(c)

ans =

   1.3744561e-13


ans =

     1.374456104485944e-13

(d)

ans =

  -3.6193271e-14


ans =

    -3.619327060278010e-14

Difference for N=1000000
(a)

ans =

  -7.8337337e-13
```

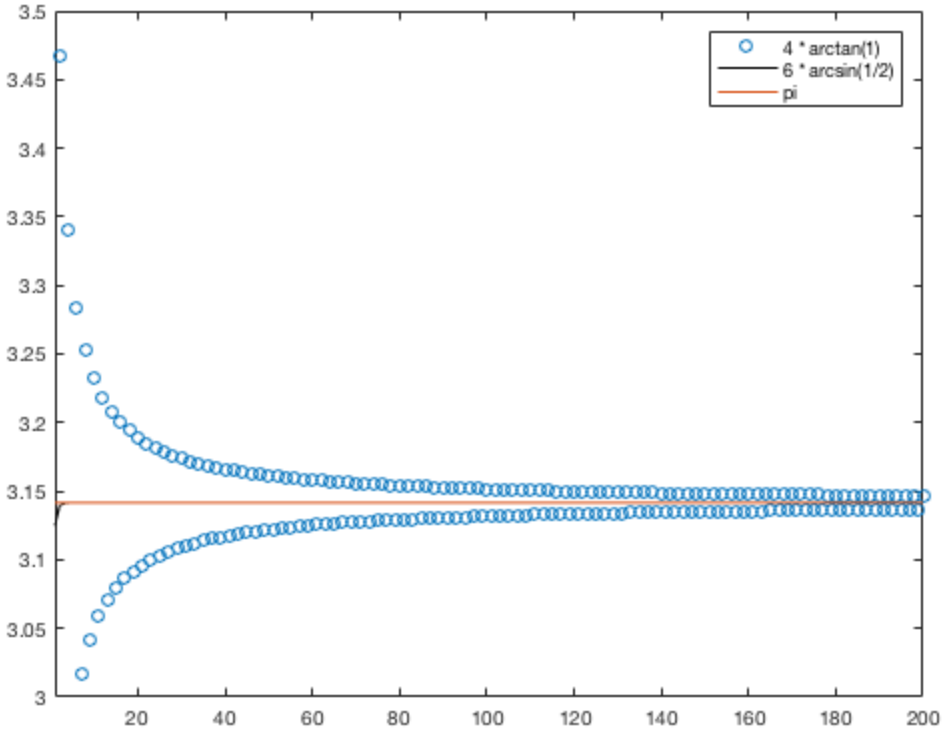
```
ans =

    -7.833733661755105e-13

(b)

ans =

   4.3742787e-14


ans =

     4.374278717023117e-14

(c)

ans =

  -8.7732044e-12


ans =

    -8.773204385192912e-12

(d)

ans =

  -5.7176486e-14


ans =

    -5.717648576819556e-14

Difference for N=10000000
(a)

ans =

  -2.6929570e-12


ans =

    -2.692956968530780e-12

(b)

ans =

  -9.7188924e-13
```

```
ans =

    -9.718892357568620e-13

(c)

ans =

  -9.2683639e-12


ans =

    -9.268363854175732e-12

(d)

ans =

  -1.5853985e-13


ans =

    -1.585398479164724e-13
```

Question 3

```
clear all;
clc;

format long;

warning('off')

% tan(pi/4) = 1 so 4 * arctan(1) = pi
% sin(pi/2) = 1 so 2 * arctan(1) = pi
% Difference between arctan and pi
a_tan = double(4 * arctan_(1000, 1))
a_sin = double(6 * arcsine_(500, 1 / 2))


% We can see arcsine_ gives better results
double(a_tan - pi)
double(a_sin - pi)

y1 = zeros(1, 200);
y2 = zeros(1, 200);

for i=1:200
```

```
    y1(i) = 4 * arctan_(i, 1);
    y2(i) = 6 * arcsine_(i, 1/2);
end

x=1:200;
plot(x, y1, 'o')
hold on;

plot(x, y2, 'k')

plot(x, ones(1, 200) * pi, '-')
legend('4 * arctan(1)', '6 * arcsin(1/2)', 'pi')
axis([1 200 3 3.5])


a_tan =

   3.142591654339544


a_sin =

   3.141592653589794


ans =

     9.990007497511222e-04


ans =

     8.881784197001252e-16
```



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