CP Assignment I

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1.

exponent=14-127=-113
mantissa=1.f=1.6250
full value=1.6250*2^{-113}=1.5648e-34

2.

(a)ln(1+1/x);
(b)$\frac{1}{\sqrt{x^2+1}+x}$;
(c)cos(2x);
(d)|cos($\frac{x}{2}$)|.

3.

The code is as followings.

```
%% Initializing
clear all;clc;
under = 1;
over = 1;
i=0; j=0;
%% to find the overflow
while i<=1749 % 1749 is determined by test
    over=over*1.5;
    i=i+1;
end
disp(['the value of overflow is ',num2str(over)])
%% to find the underflow
while j<=9999999
    under = under/1.5;
    j=j+1;
end
disp(['the value of underflow is ',num2str(under)])
```

After running the code, I find the result is that
overflow=1.4445e+308
underflow=4.9000e-324

4.

The code is as followings.

```
clear all;clc;
%% For single precision
eps1=single(1.0);
while 1+eps1~=1
```

```
    eps1=eps1/2;
end
disp(['machine precision for single-precision is ',num2str(eps1)])

%% For double precision
eps2=1.0;
while 1+eps2~=1
    eps2=eps2/2;
end
disp(['machine precision for double-precision is ',num2str(eps2)])
```

After running the code, I find the result is that
for single precision: eps=5.9605e-08
for double precision: eps=1.1102e-16

5.

note:I assume that the n is an even number because I think the quesition is nothing to do with n's parity.
(a)Algorithms:
1.input n; j=n/2; s=0
2.s=s+ $\frac{2}{(4j-3)*(4j-1)}$
j=j-1
3.do the second step until j=0
4. output s and calculate the relative error.
(b)Code:

```
clear all;
clc;
n=input('please enter an even positive number: ');
j=n/2;s=0;
%%  sum the series
while j>=1
    s=s+2/((4*j-3)*(4*j-1));
    j=j-1;
end
s=4*s;
rr=(s-pi)/pi;
disp(['the value of π by using n terms of the series is ',num2str(s)])
disp(['the relative error is ',num2str(rr)])
```

(c)results of different n:
n=10,s=3.0418,re(relative error)=-0.031752
n=20,s=3.0916,re=-0.015906
n=40,s=3.1166,re=-0.0079565
n=10000,s=3.1415,re=-3.1831e-05
(d)As the n increases, s becomes closer to pi, so if we want to get a more precise pi, we can increase n as larger as better.