Matlab Homework week 5

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1 Sum

1.1 Description

get the solution and the answer of

$$\sum_{i=0}^{63} 2^i = 1 + 2 + 2^2 + 2^3 + ... + 2^6 3$$

by useing *for* and *while* structure.
And give a simple method of the solution.

1.2 Analysis

For the second question, Use the function *sum* in Matlab directly......

1.3 Codes and Result

Question 1

```
s=0;
for i=0:63
    s=s+2^i;
end
```

```
s=0;
i=0;
while(i<=63)
    s=s+2^i;
    i=i+1;
end
```

Question 2

```
sum(2.^[0:63]);
```

Output:
ans=1.844674407370955e+19

2 Funtion of arcsin

2.1 Description

$$arcsinx \approx x + \frac{x^3}{2\cdot 3} + \frac{1\cdot 3\cdot x^5}{2\cdot 4\cdot 5} + \cdots + \frac{(2n)!x^{2n+1}}{2^{2n}(n!)^2(2n+1)}$$
$$\frac{(2n)!x^{2n+1}}{2^{2n}(n!)^2(2n+1)} < 0.02$$

give the result of approximate value of arcsinx.
Hint:
use funtion *factorial*,the loop structure *while*.

2.2 Anaylsis

use factorial in the loop while and add the i by step.

2.3 Code and Result

```
function r=arcsin(x)
n=0;
r=0;
while(factorial(2*n)*x^(2*n+1)/(2^(2*n)*(factorial(n)^2)
    *(2*n+1))>=0.002)
    r=r+factorial(2*n)*x^(2*n+1)/(2^(2*n)*(factorial(n)^2)
        *(2*n+1));
    n=n+1;
end
end
```

»arcsin(0.5) Output:
ans=0.5232
$(pi/6 \approx 0.5236)$

3 Solving gcd and lcm and judge prime number

3.1 Description

Like title.
For the second Question, 1 means the number is prime, else 0.

3.2 Anaylsis

Question 1

Euclidean algorithm.

Question 2

Each i in loop $[2,\sqrt{n}]$ can't be divisible,otherwise the number is not prime number.
use the function *mod* and *floor*.

3.3 Code and Result

Question1:

```
function [b,y]=by(m,n)
m0=m;n0=n;
z=mod(m0,n0);
while(z~=0)
     m0=n0;n0=z;
     z=mod(m0,n0);
end
b=n0;y=m*n/b; %gcd b,lcm y
end
```

»[b,y]=by[9,15]
Output:
b=3,y=45

Question2:

```
function judge=sushu(n)
judge=1;
for i=2:floor(sqrt(n))+1
      if (mod(n,i)==0) judge=0;
```

```
            end
        end
        end
```

»sushu(6)
Output:
ans=0

»sushu(11)
Output:
ans=1

4 Magic matrix

4.1 Description

In MATLAB, the magic() function is called the cube matrix function, which automatically generates a special N-order square matrix (where N=1, 2， 3, 4, 5.....). These N-order squares have a common characteristic that the sum of the elements in each row, column or diagonal is equal and constant. Try to design a function mag(n) to verify its wonderful properties for the N-order cube.

4.2 Anaylsis

use function *diag* to get the vetctor of diagonal elements.
use function *sum* to summary the each row and column and diagonal,and judge whether they are equal.

4.3 Code and Result

```
function [judge]=mag(M)
    n=length(M);
    judge=(sum(find(sum(M,2)~=(1+n^2)*n/2))==0)&(sum(find(sum(M
        ,1)~=(1+n^2)*n/2))==0)&(sum(diag(M))==(1+n^2)*n/2)&(sum(
        diag(rot90(M)))==(1+n^2)*n/2);
    % 1:is magic matrix
    % 0:not magic matrix
end
```

»mag(magic(5))
Output:
ans=1

5 Filter

5.1 Description

Find the number of [2,999] that satisfies the following conditions at the same time
(1) The sum of the numbers of the numbers is an odd number
(2) The number is prime

5.2 Anaylsis

use function *sushu* to get prime numbers.
use the *sum(sum(num2str(i)-'0')* to solve the value of numbers of the numbers.

5.3 Code and Result

```
for i=2:999
    if (mod(sum(num2str(i)-'0'),2)==1&&sushu(i)==1)
        disp(i);
    end
end
```

Output:
ans= [3,5,7,23,29,41,43,47,61,67,83,89,113,131,137,139,151,157,173,179,191,193,197,199,223,227,229,241,263,2
313,317 ,331 ,337 ,353 ,359 ,373 ,379 ,397 ,401 ,409 ,421 ,443 ,449 ,461 ,463 ,467
,487 ,557 ,571 ,577 ,593 ,599 ,601 ,607 ,641 ,643 ,647 ,661 ,683 ,719 ,733 ,739
,751 ,757 ,773 ,797 ,809 ,821 ,823 ,827 ,829 ,863 ,881 ,883 ,887 ,911 ,919 ,937
,953 ,971 ,977 ,991 ,997]