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# Problem 1

(a)Choose two non-integer, distinct numbers a and b between -100 and 100. Then, use MATLAB to compute: A1=a+b, A2=(ab/(a^2+1), A3=|a^2-b|+|b^2-a|, A4=e^(1/(a-b+1)), A5=ln((a-b)^2+sqrt|b|)), A6=log_{10}(10^{a+b}), A7=floor(a+b-ab).

(b) Use MATLAB to compute:

B1=tan(30^o)+cos(60^o)-sin^2(30^o), B2=sin(1)cos(1)+tan(2), B3=arctan(1/sqrt(2)), B4=arcsin(0.5), B5=e^(sin(2)), B6= 12!, $x=ln((5^6-6^5)/(e^6-e^5)), y=(arcsin(0.5)^(-3), z=pi(sqrt(20)-e^2)/(5^0.25+1)^2-xy.

```
disp('(a)')
a=5.3; b=-3.7;
A1=a+b;
A2=(a*b)/(a^2+1);
A3=abs(a^2-b);
A4=exp(1/(abs(a-b)+1));
A5=log((a-b)^2+sqrt(abs(b)));
A6=log10(10^(a+b));
A7=floor(a+b-a*b);
fprintf('My choice: a=%f,b=%f\n',a,b)
fprintf(' A1=%f\n A2=%f\n A3=%f\n A4=%f\n A5=%f\n A6=%f\n A7=%f
\n',A1,A2,A3,A4,A5,A6,A7)
disp('(b)')
B1=tand(30)+cosd(60)-(sind(30))^2;
B2=sin(1)*cos(1)+tan(2);
B3=atan(1/sqrt(2));
B4=asin(0.5);
B5=exp(sin(2));
B6=factorial(12);
x=log((5^6-6^5)/(exp(1)^6-exp(1)^5));
y=(asin(0.5))^(-3);
z=pi*(sqrt(20)-exp(2))/(5^(1/4)+1)^2-x*y;
fprintf(' B1=%f\n B2=%f\n B3=%f\n B4=%f\n B5=%f\n B6=%.f\n x=%f\n y=%f
\n z=%f\n',B1,B2,B3,B4,B5,B6,x,y,z)
```

*(a)*

```
My choice: a=5.300000,b=-3.700000
 A1=1.600000
 A2=-0.674115
 A3=31.790000
 A4=1.105171
 A5=4.417919
 A6=1.600000
 A7=21.000000
(b)
 B1=0.827350
 B2=-1.730391
 B3=0.615480
 B4=0.523599
 B5=2.482578
 B6=479001600
 x=3.426817
 y=6.966331
 z=-25.344015
```

# Problem 2

The volume of a right circular cone of height h and radius of the circular base r is given by V=(pi*r^2*h)/3. A particular conical tank is 12 m tall and has a radius of 4 m. You want to construct another conical tank with volume 50 percent greater but having the same height. How large must its radius be?

```
h=12;
r=4;
V=(pi*r^2*h)/3;
V1=V+0.5*V;
R=sqrt(V1/(4*pi));
fprintf('The radius of the larger cone is R = %f \n',R)
```

```
The radius of the larger cone is R = 4.898979
```

# Problem 3

Choose a complex number z=a+bi with a and b nonzero. Let w=(z^2-z*zconj+zconj^2+i)/(zconj+z+z^3). Use MATLAB to compute the conjugate, modulus, argument, and the real and imaginary parts of w.

```
z=-4+3i;
w=(z^2-z*conj(z)+conj(z)^2+1i)/(conj(z)+z+z^3)
conjugate_of_w=conj(w)
modulus_of_w=abs(w)
argument_of_w=angle(w)
real_part_of_w=real(w)
imaginary_part_of_w=imag(w)
```

```
w =
  -0.0186 + 0.0883i
conjugate_of_w =
  -0.0186 - 0.0883i
modulus_of_w =
    0.0902
```

```
argument_of_w =
    1.7786
real_part_of_w =
   -0.0186
imaginary_part_of_w =
    0.0883
```

# Problem 4

Execute the commands 3/2*i and 3/2i. Can you explain the difference between the two results?

```
alpha=3/2*1i
beta=3/2i
% The numbers are different because alpha is 1.5i,
% while beta is the reciprocal of the complex number 3
% divided by 2i, which is -1.5i.
```

```
alpha =
   0.0000 + 1.5000i
beta =
   0.0000 - 1.5000i
```

# Problem 5

The Richter scale is a measure of intensity of an earthquake. The energy E (in joules) released by the quake is related to the magnitude M on the Richter scale as follows: $E=10^4.4*10^(1.5M). How much more energy is released by a magnitude 7.5 quake than a 5.5 quake?

```
E=@(M)(10^4.4)*10^(1.5*M);
ME=E(7.5)-E(5.5);
fprintf('This much more energy (in Joules) is released %d \n',ME)
```

```
This much more energy (in Joules) is released 4.462369e+15
```

# Problem 6

The volume of a sphere with radius r is given by V=(4*pi*r^3)/3. Write a script that calculates the volume of the sphere for r=0.123 and print the result in a nice sentence format.

```
r=0.123;
V=(4*pi*r^3)/3;
fprintf('The volume of a sphere of radius r = %f is V = %f\n',r,V)
```

```
The volume of a sphere of radius r = 0.123000 is V = 0.007795
```

# Problem 7

Create the (anonymous) function f(x,y,z)=xyz-cos(pi*x)*sin^2(pi*y)+z and find f(1.5,0.5,1).

```
f=@(x,y,z)x.*y.*z-cos(pi*x).*sin(pi*y).^2+z;
fprintf('f(1.5,0.5,1)=%1.2f\n',f(1.5,0.5,1))
```

```
f(1.5,0.5,1)=1.75
```

# Problem 8

The formula for computing compounded investment is given by x=x_0*(1+r/100)^n, where x=accumulated amount, x_0=initial investment, r=rate of annual interest in percentage, and n=number of years. Define an anonymous function to compute x with (x_0,r,n) as the input. Using this function, compare the growth of a $10,000 investment over a period of five years earning an interest of 10% with that over a period of 10 years earning an interest of 5%.

```
x=@(x0,r,n)x0*(1+r/100)^n;
M1=x(10000,5,10);
M2=x(10000,10,5);
fprintf('The amount of money in the first situation is M1 = %.2f
\n',M1)
fprintf('The amount of money in the second situation is M2 = %.2f
\n',M2)
fprintf('Notice that M1 is (barely) more than M2.\n')
```

```
The amount of money in the first situation is M1 = 16288.95
The amount of money in the second situation is M2 = 16105.10
Notice that M1 is (barely) more than M2.
```

# Problem 9

Define a function called msp6 that calculates the mean value, sum, and product of six numbers. That is, the input is a list of six numbers a_1,a_2, ... ,a_6, and the output should be the mean value, sum, and product of these numbers. Using this function, calculate the mean value, sum, and product of the numbers -3.4, 2.1, 3.7, -10, 3.4, -5.8.

```
type msp6
[M,S,P]=msp6(-3.4,2.1,3.7,-10,3.4,-5.8);
fprintf('Mean=%f, Sum=%f, Product=%f\n',M,S,P)
```

```
function [Mean,Sum,Product] = msp6(a1,a2,a3,a4,a5,a6)
% This MATLAB function computes the mean, sum, and product
% of six given numbers.
a=[a1,a2,a3,a4,a5,a6];
Mean=mean(a);
Sum=sum(a);
Product=prod(a);
end
Mean=-1.666667, Sum=-10.000000, Product=-5209.629600
```

# Problem 10

The area and volume of a right circular cone are given by A=pi*r*(r+sqrt(h^2+r^2)) and V=(pi*r^2h)/3, respectively, where r is the radius of the circular base and h is the height of the cone. Write a function (call it cone) that accepts the radius r and height h as inputs and calculates the area A and volume V as outputs. Using this function, calculate the area and volume of a cone with r=3 and h=6.

```
type cone
[A,V]=cone(3,6);
```

```
fprintf('Area=%.4f, Volume=%.4f\n',A,V)
```

```
function [A,V] = cone(r,h)
% This function calculates the area, A, and volume, V,
% of a right circular cone of radius r and height h.
A=pi*r*(r+sqrt(h^2+r^2));
V=pi*r^2*h/3;
end
```

```
Area=91.4977, Volume=56.5487
```

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