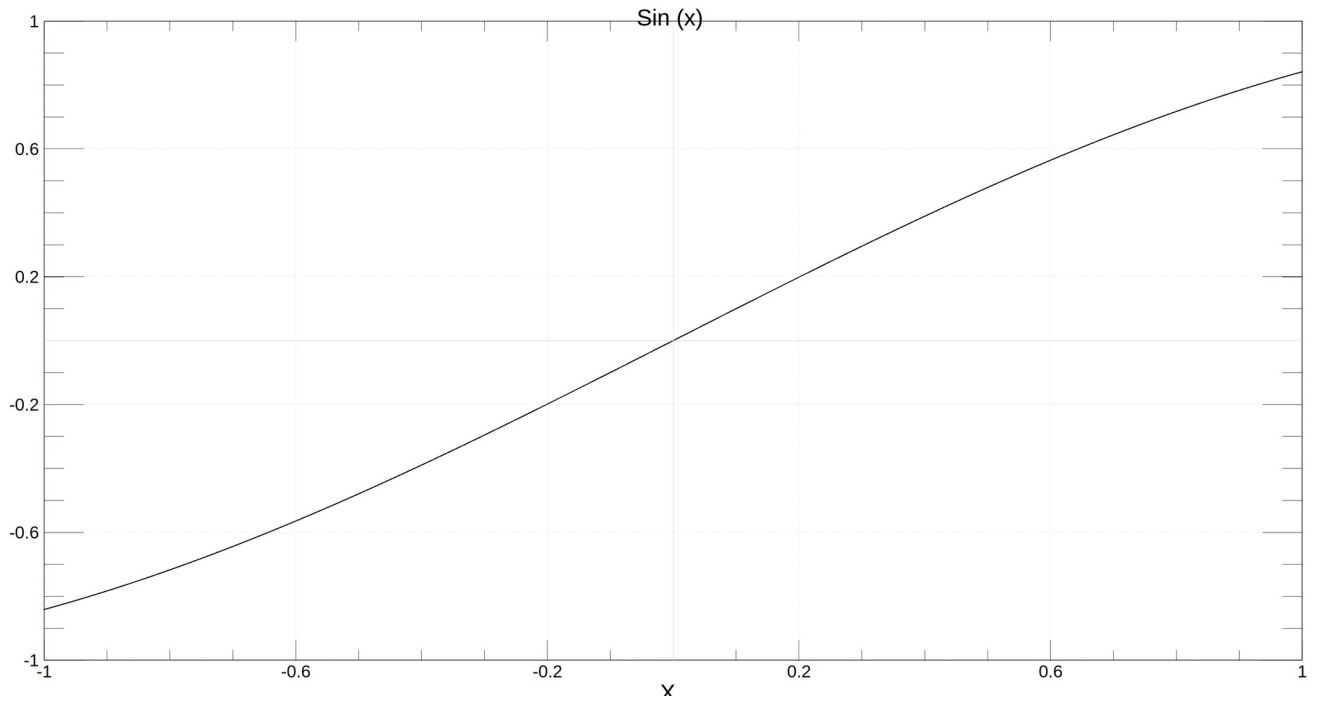
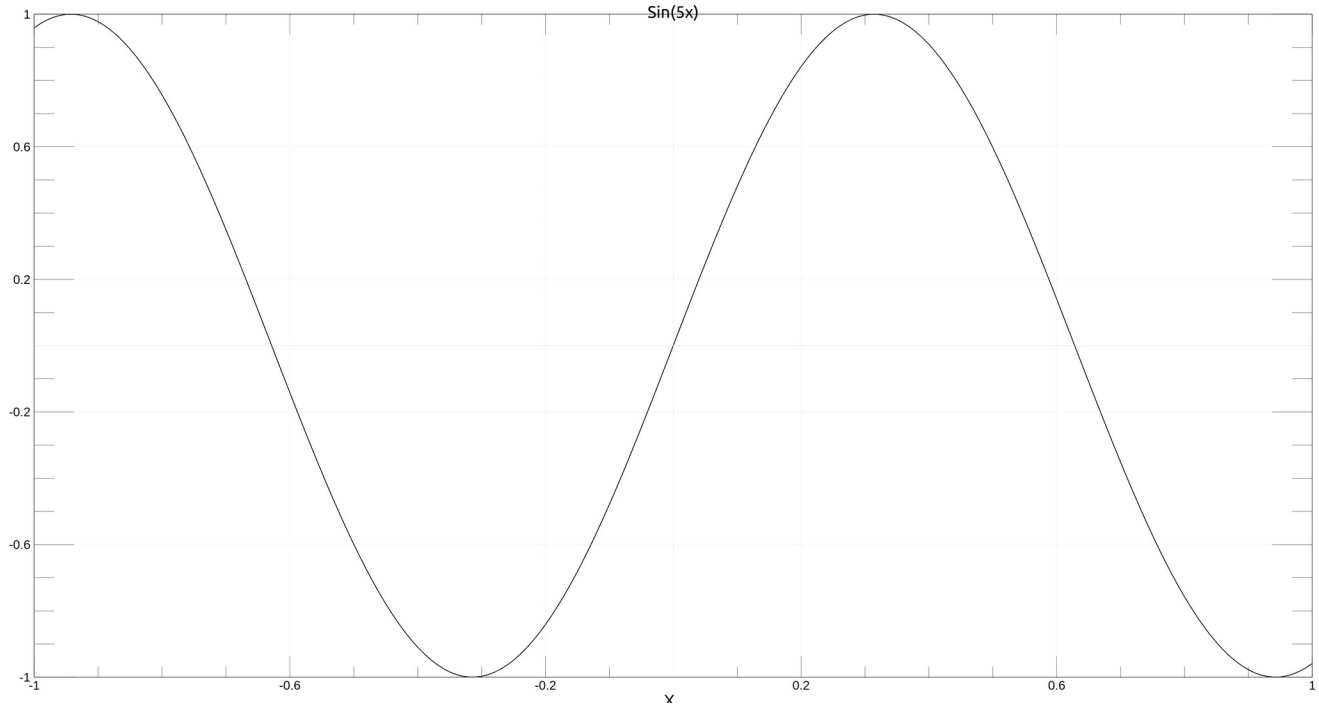
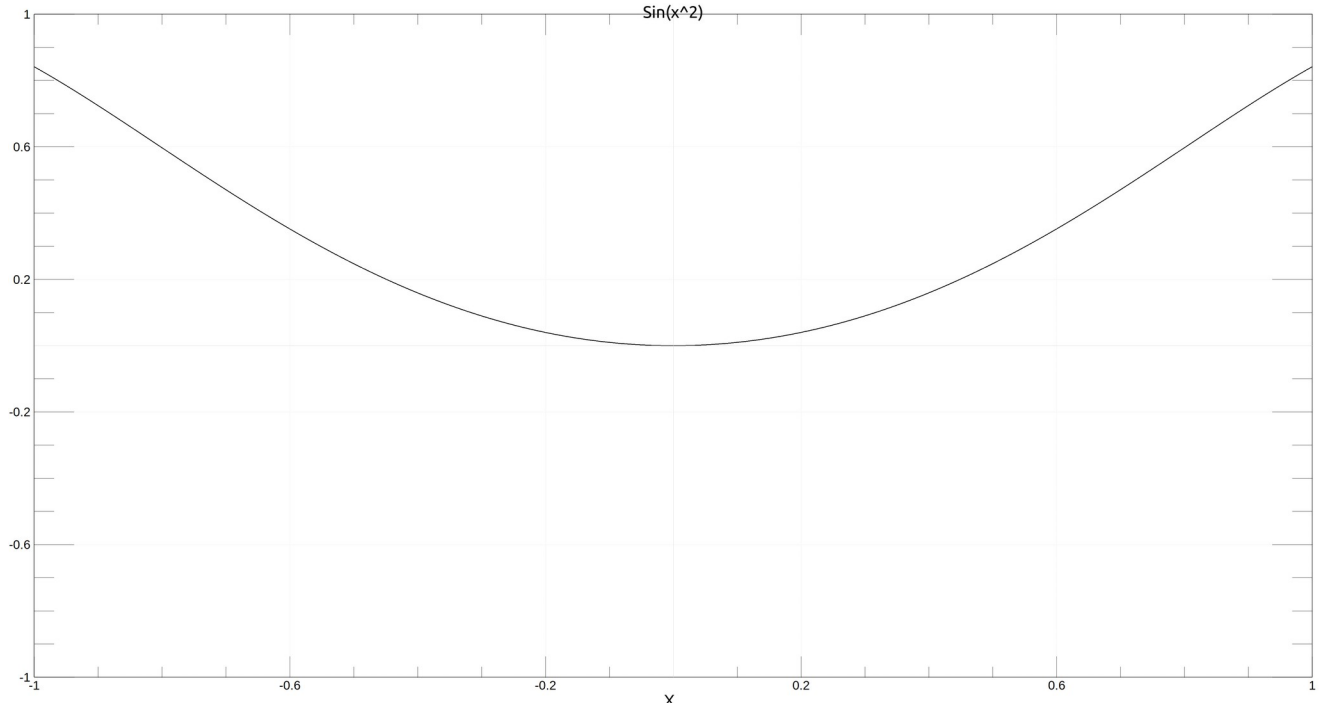
Assignment-3

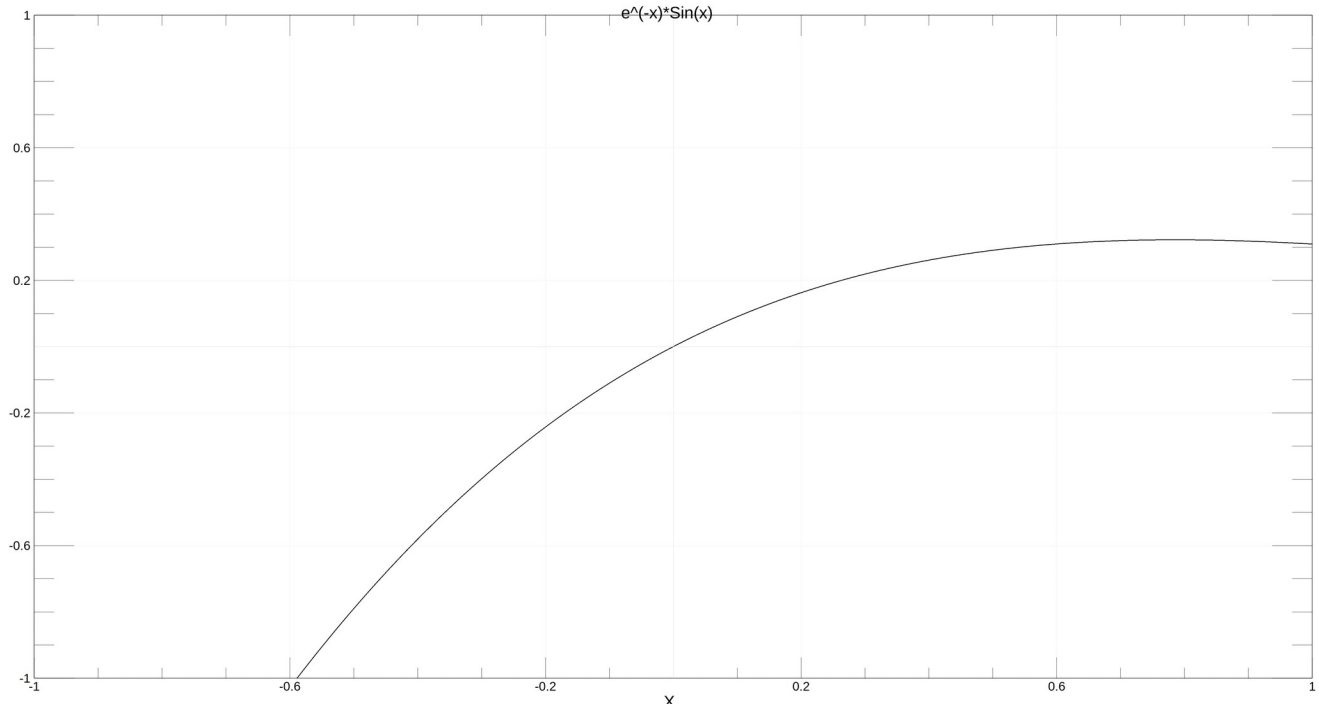
1. Using both the methods of vectors and determinants, the volume of the of the crystal comes out to be 9 Units.

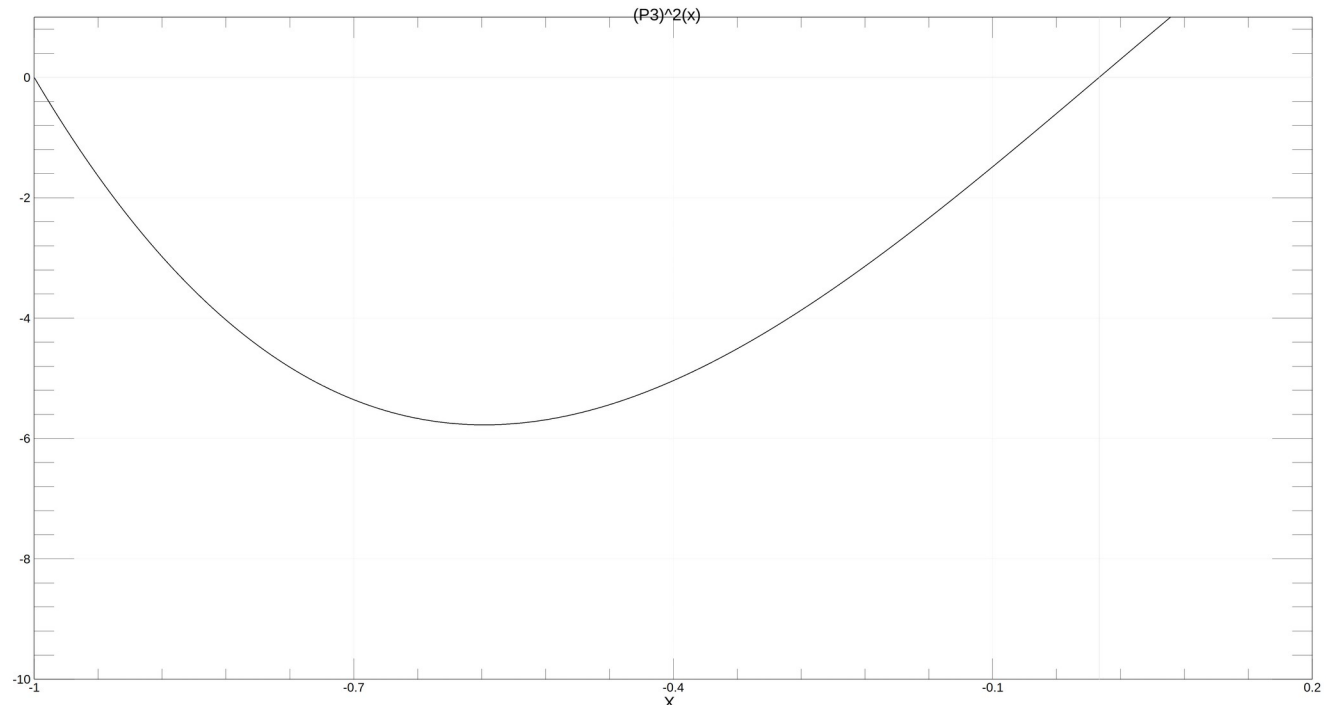
2. As per the question, the various plots plotted are given below:

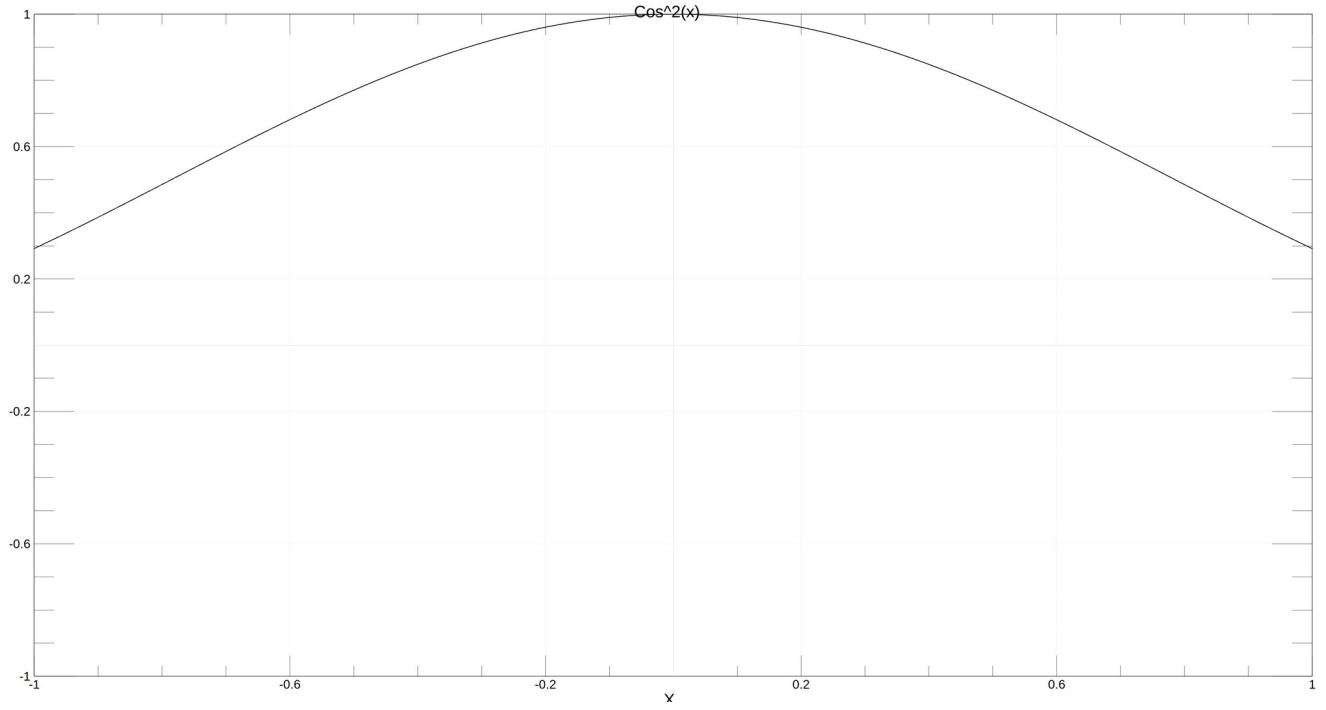


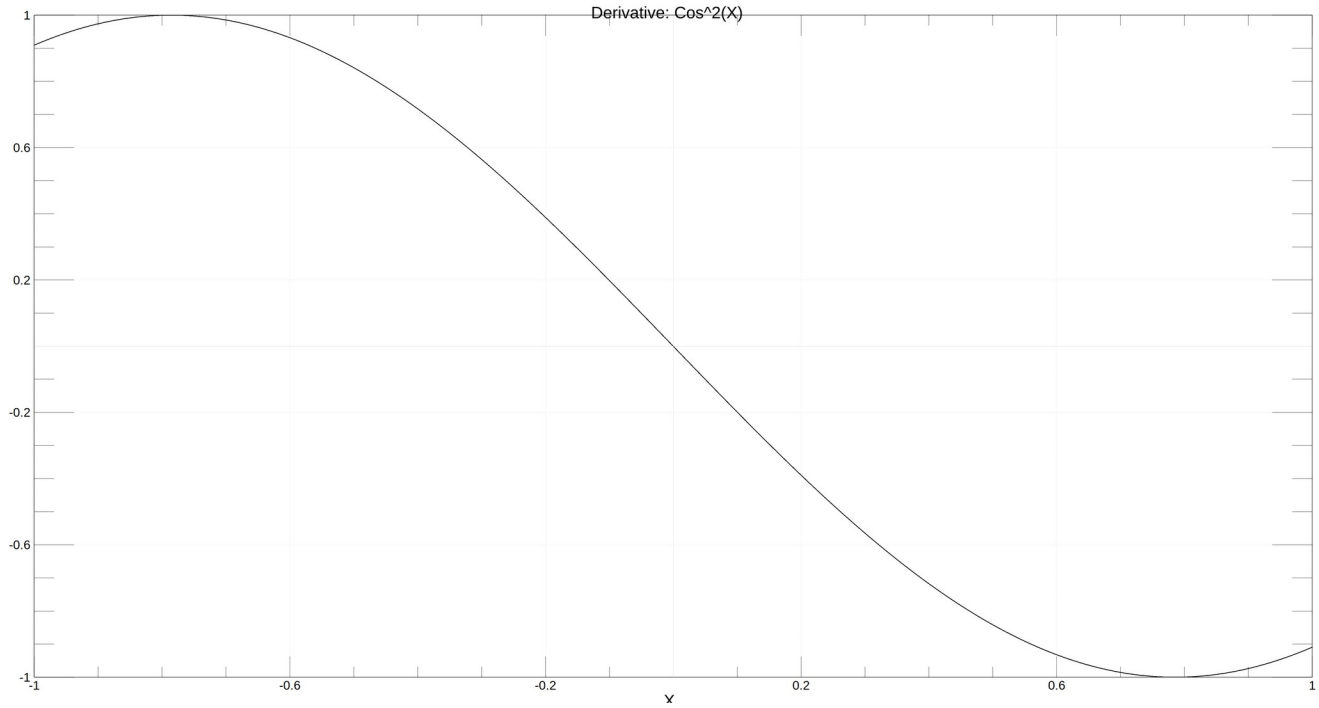



Sin(x^2)
1
0.6
0.2
-0.2
-0.6
-1
-1
-0.6
-0.2
0.2
0.6
1
X

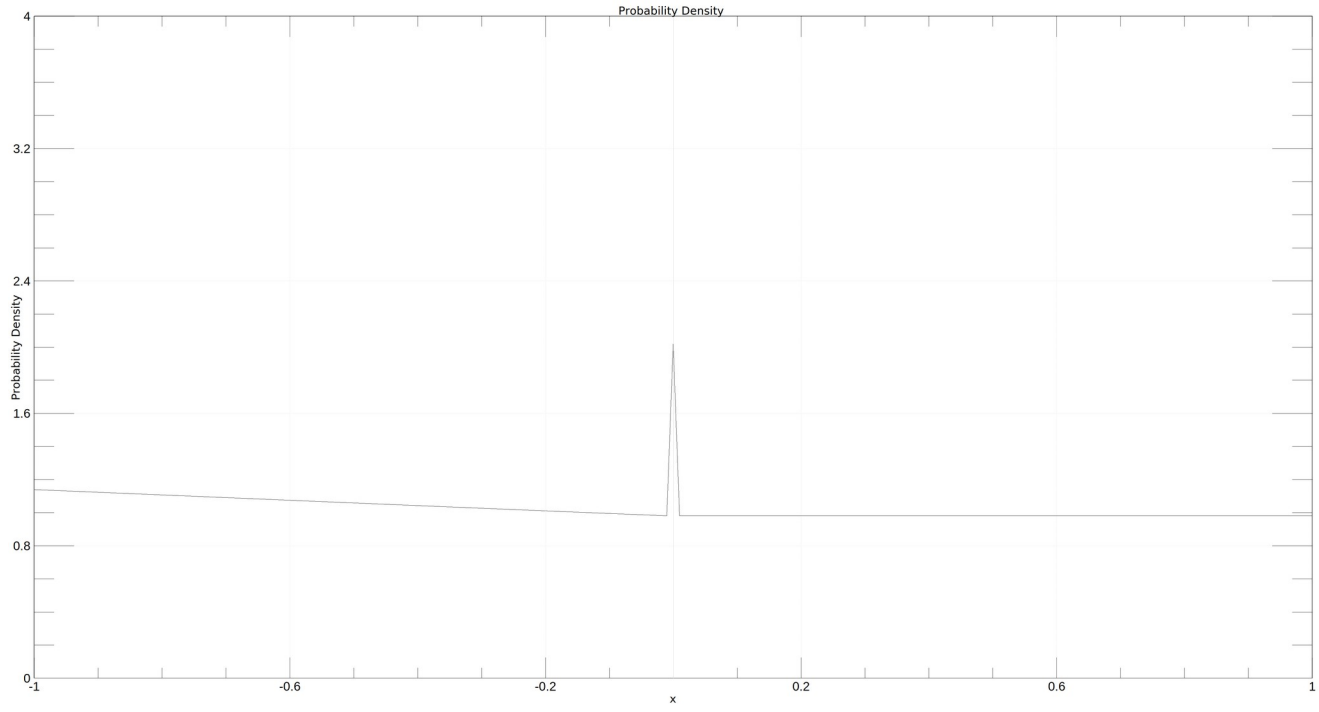

e^(-x)*Sin(x)
1
0.6
0.2
-0.2
-0.6
-1
-1
-0.6
-0.2
0.2
0.6
1
X


(P3)^2(x)
0
-2
-4
-6
-8
-10
-1
-0.7
-0.4
-0.1
0.2
X


Cos^2(x)
1
0.6
0.2
-0.2
-0.6
-1
-1
-0.6
-0.2
0.2
0.6
1
X



6. Probability density function for ka=0.2 and V/E=0.5 is obtained as:

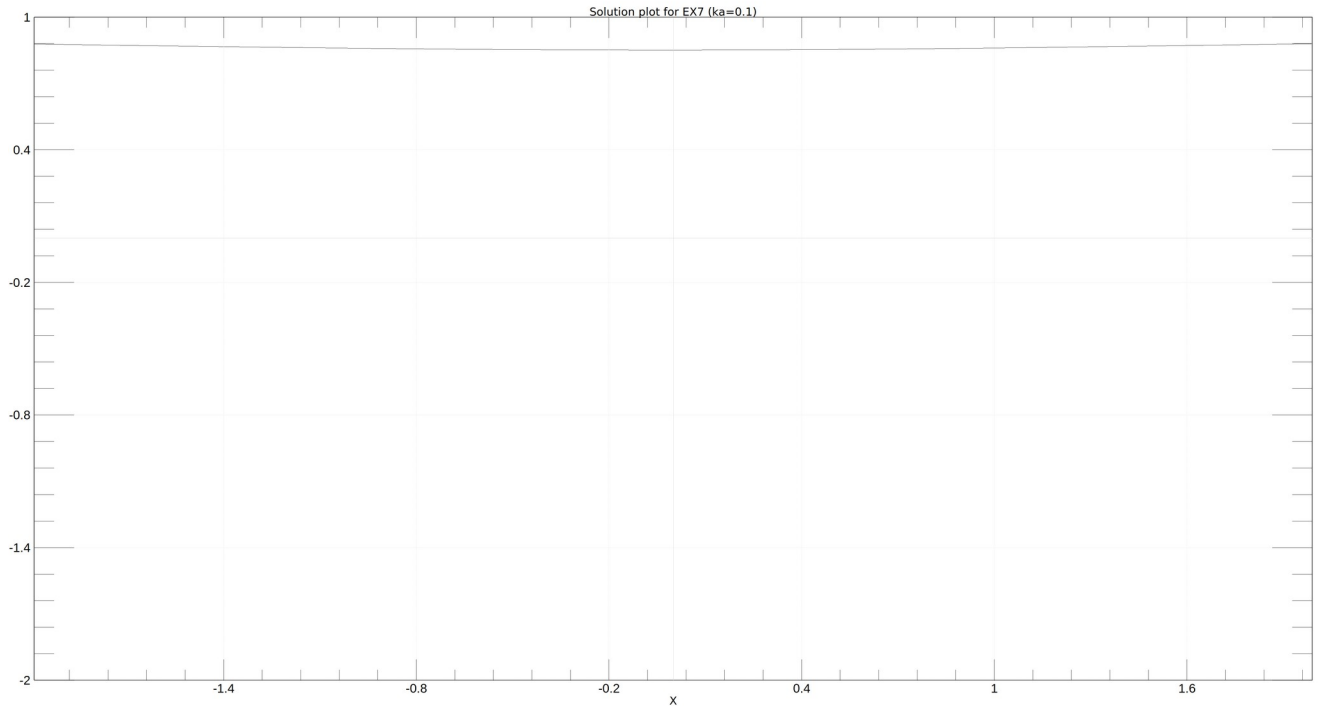


7. Values of Reflection Coefficients and Transmission Coefficients were obtained for corresponding values of V/E and Ka

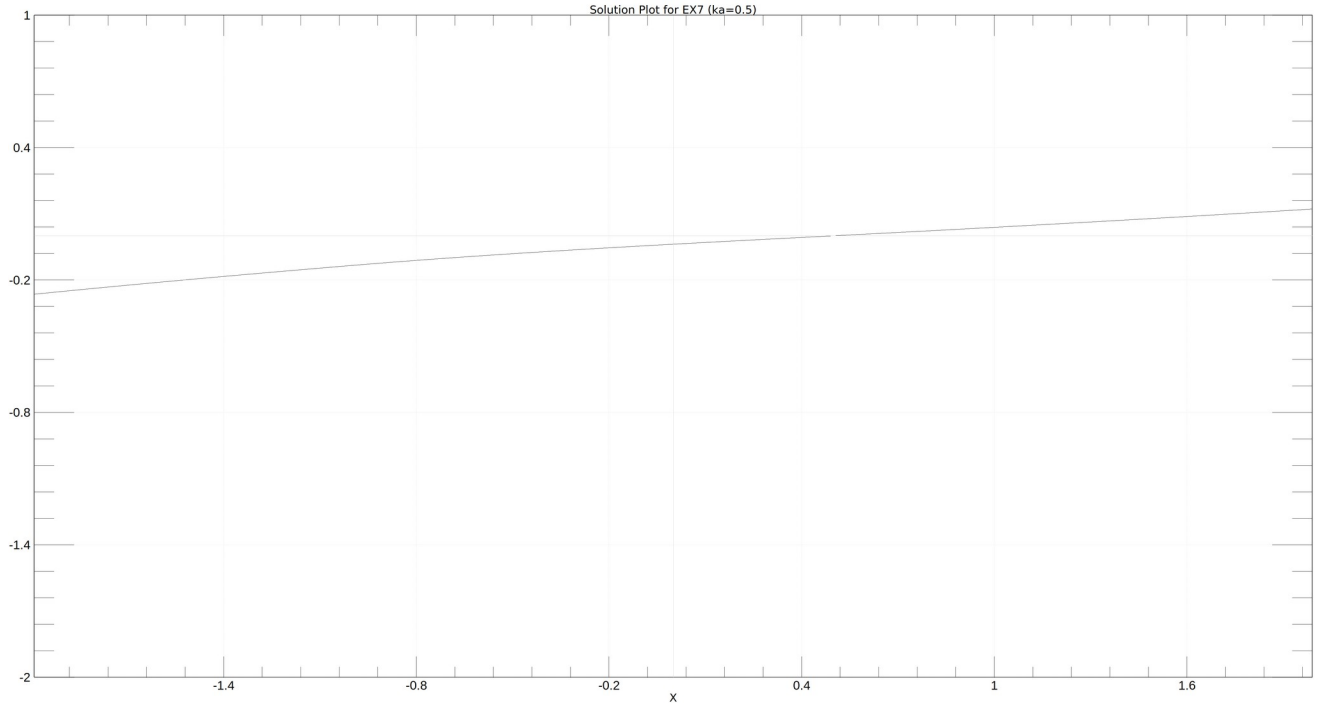
S. No.	V/E	Ka	Reflection Coeff. (R)	Transmission Coeff. (T)
1	0.5	0.1	-0.022,i0.146	0.97765,-i0.1495
2	1	0.2	-0.3072, -i0.439	0.691,-0.483i
3	1.5	0.3	-0.824, -0.280i	0.158, -0.465i

For a sanity check, the sum of the norms of the coefficients was always 1.

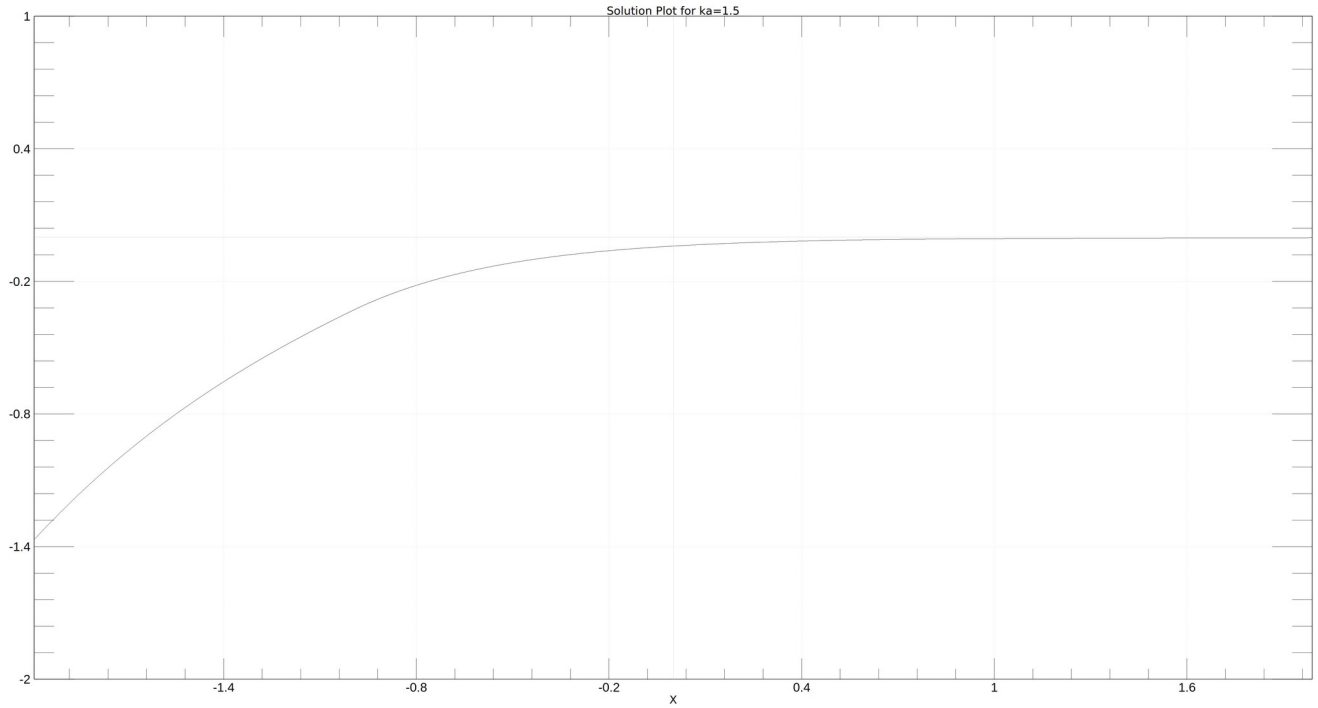
8. For the sake of plotting, only the real part of the final solution is depicted. V/E=1.5 in all cases



Solution for ka=0.1



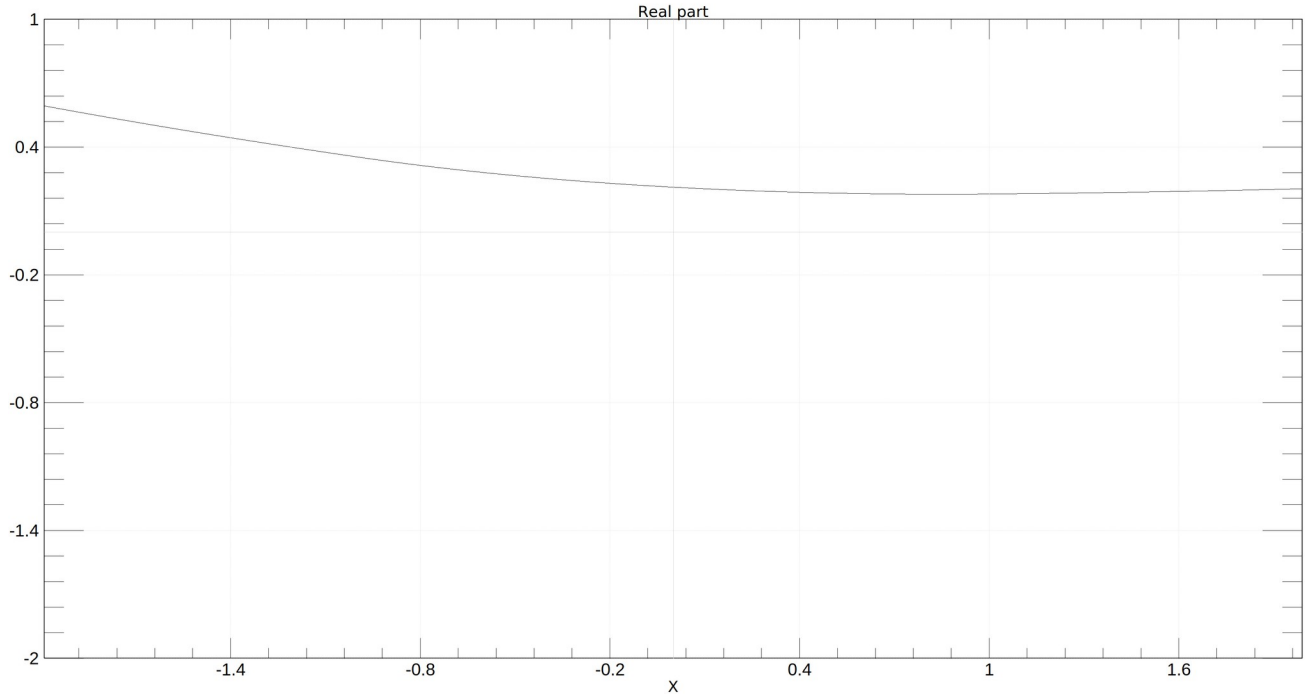
Solution plot for ka=0.5



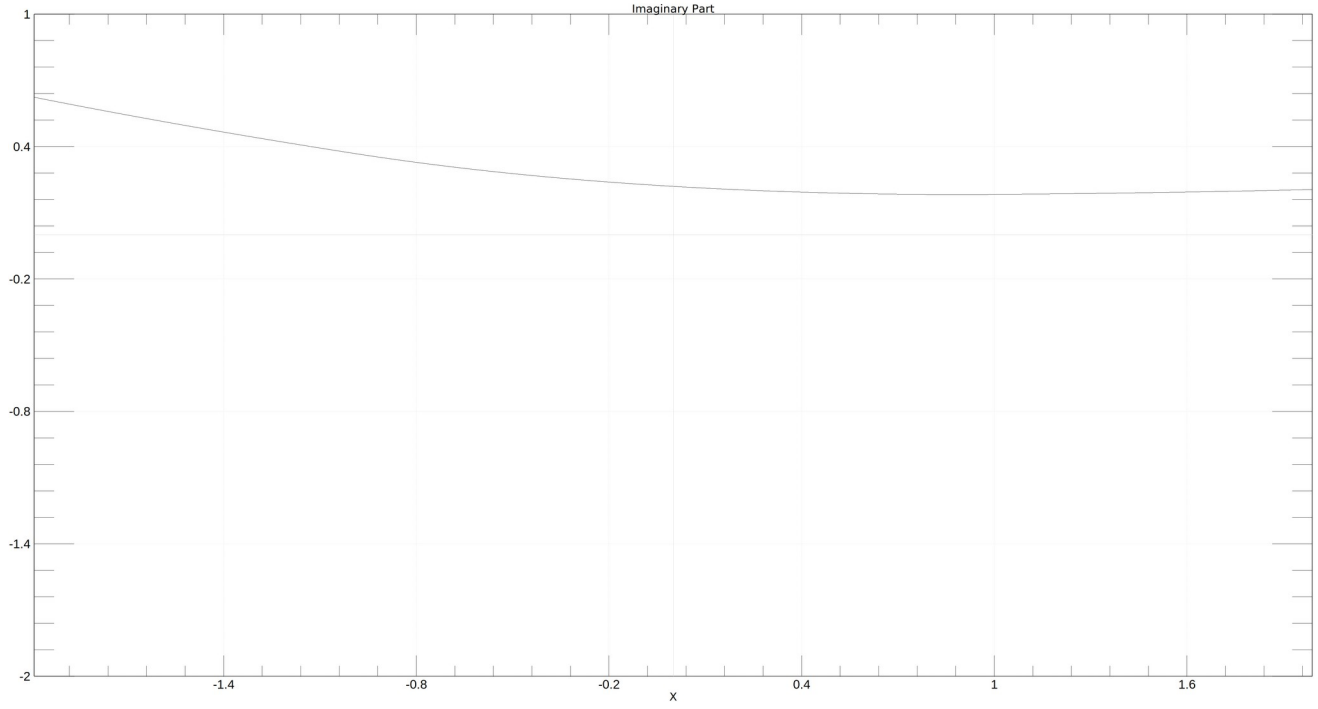
Solution plot for ka=1.5

9. I was able to write the code for n=0 and n=1. But I was not able to get the desired plot. I am unsure about the exact expectation from the solution of the problem.

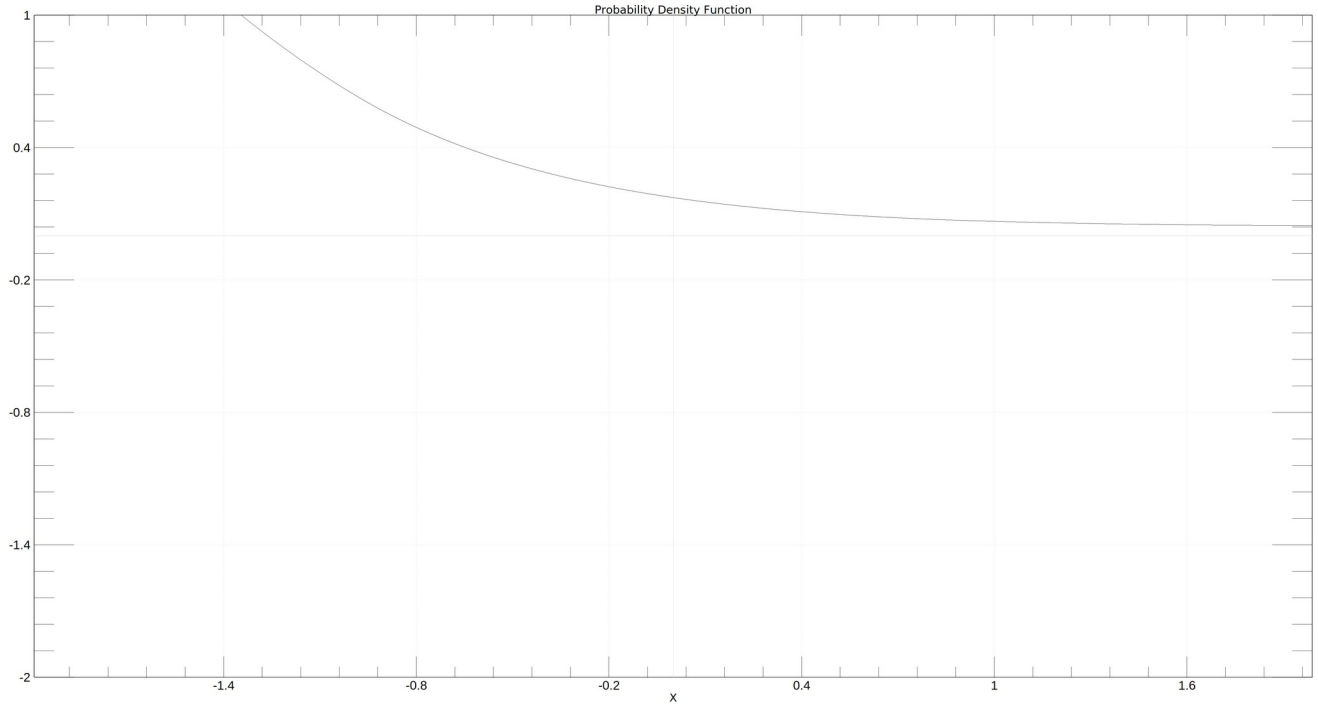
14. Omega is assumed to be 1. Problem 7-8 is used used as the skeleton of the code. Ka=0.5. V0=1.5.



Plot for real part



Plot for Imaginary part



Plot for Probability density function

The plots for real and imaginary part obtained were dynamic in nature (which I am unable to show in the document). The plotter program is input based with default to real part. For real part input is 1, for the imaginary part, the input is 2 and for the probability density function the input is 3.