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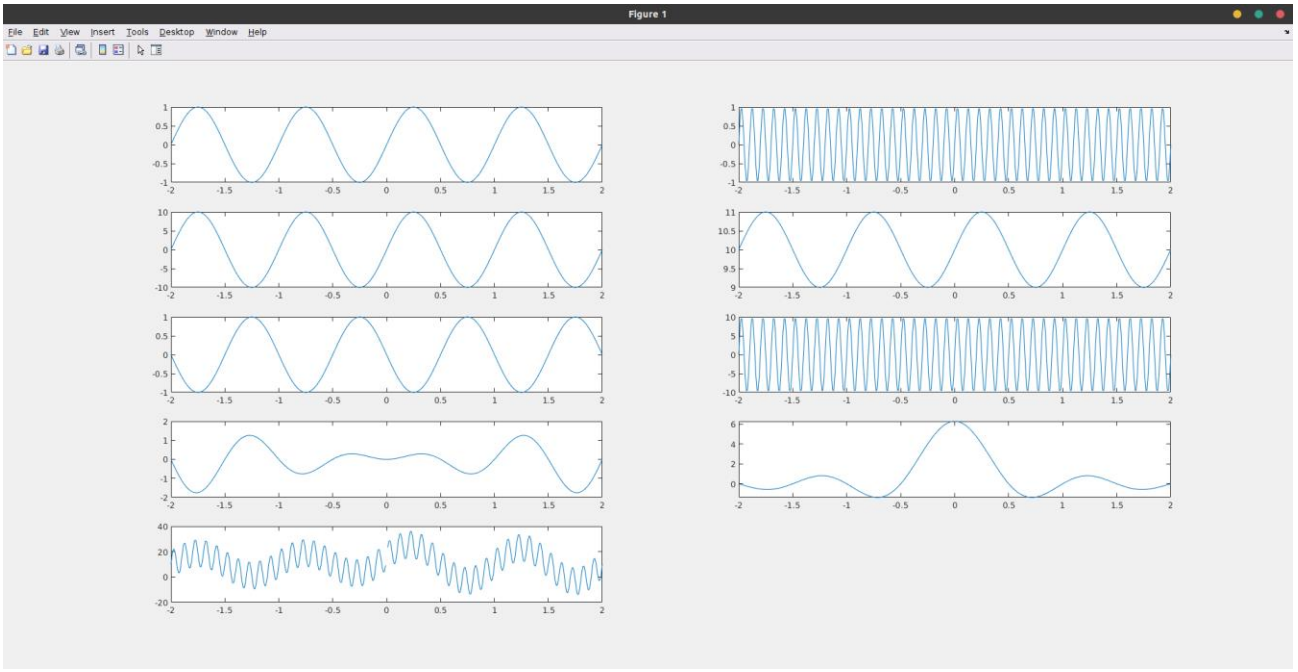
Problem 1

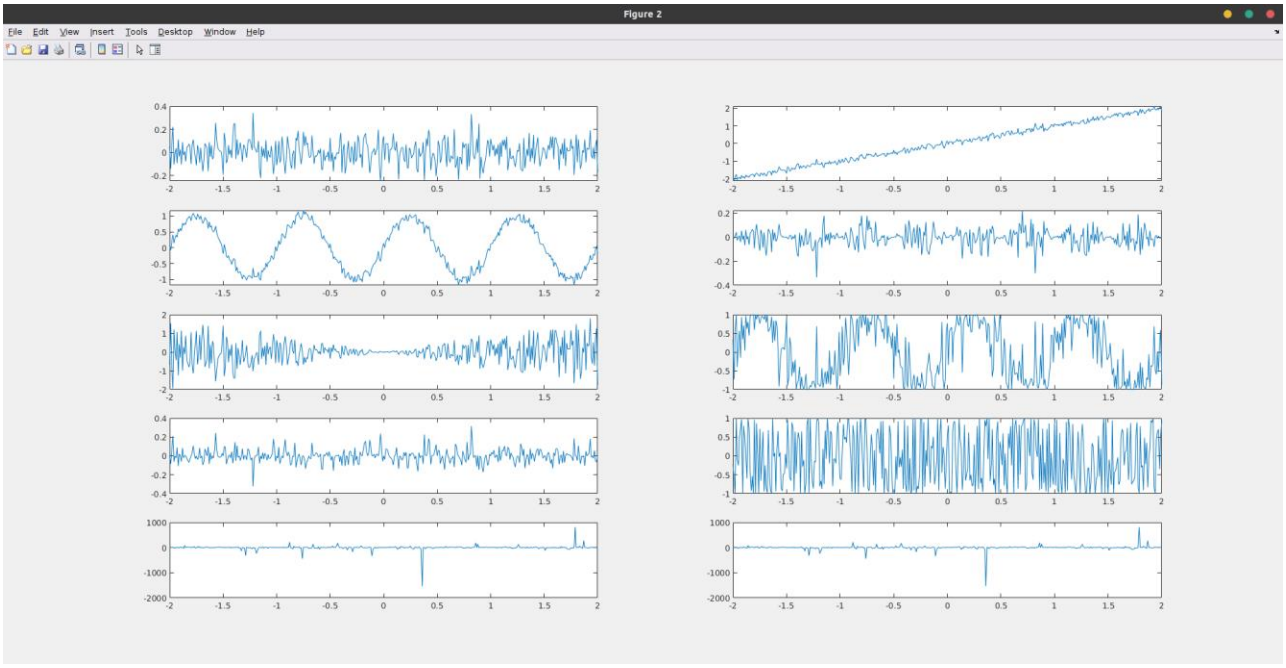


From problem 1 I have learned that generating some signals according to given formulas needs some regulation. What I mean is that I need to transpose t (time vector from –2 to 2 increasing by 0.01) if I multiple t by signal vector or I need to take transpose of signal vector is I multiple it by t vector. I can take transpose of them by putting "." at the end of the terms.

If we look at the signals we can see where the signal gets maximum value and minimum values. For instance, when the t value makes the overall sin value multiple of pi then we signal value gets 0 except for the case the formula is added any constant value like this "y4=sin(2*pi*t) +10".

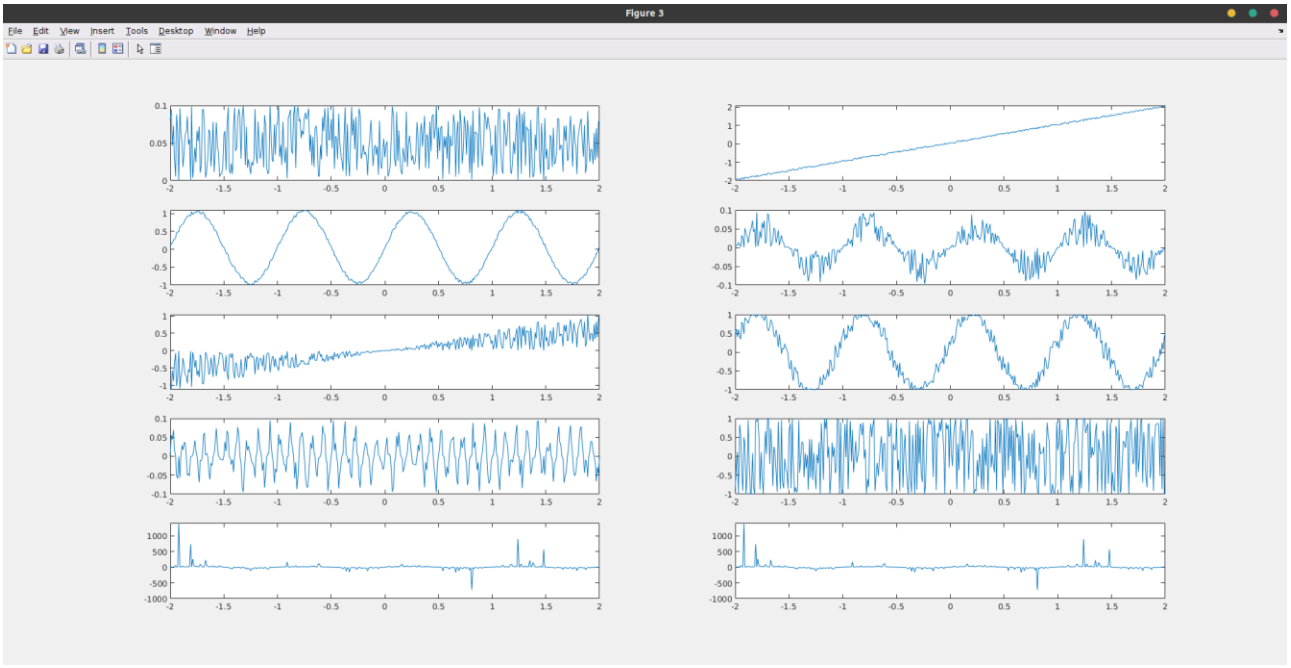
After I generated all signals and added them up the y9 value gets the max value when the time is 0.

Problem 2



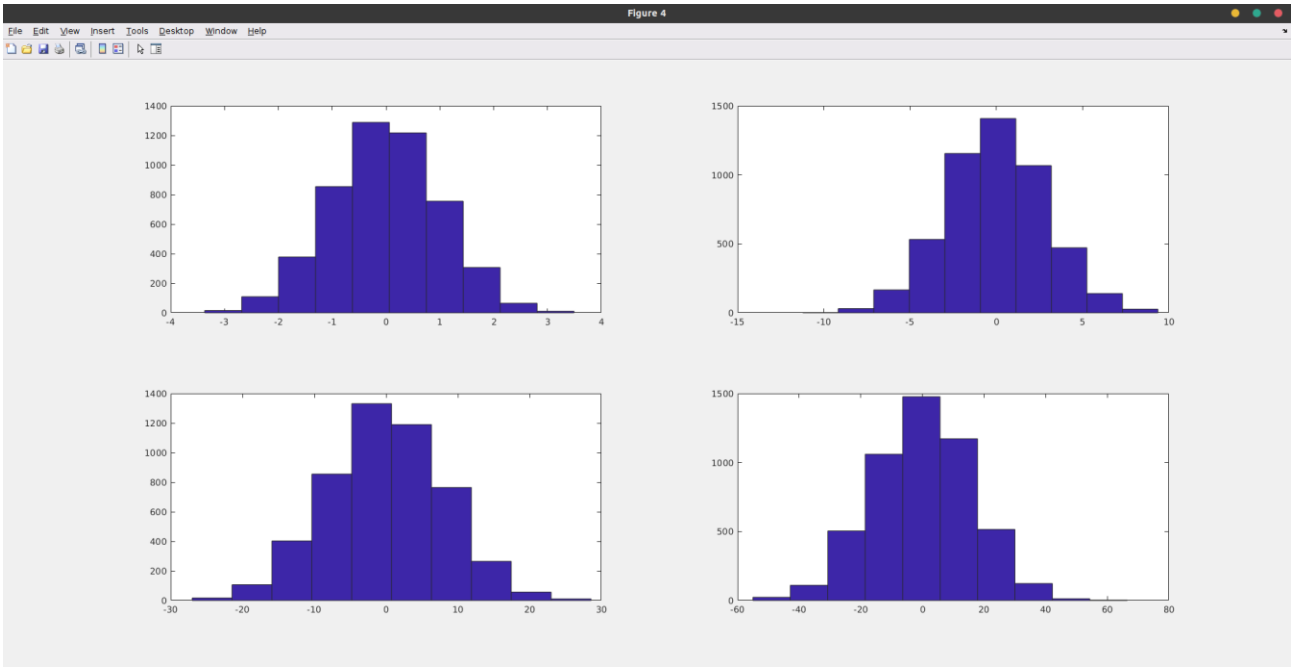
For Problem 2 I used “randn” function in a way that I can multiple or add the previous signal functions (randn(1,401) generate 401 Gaussian random numbers and store them in a vector) and apply the necessary operations like problem 1.

Problem 3



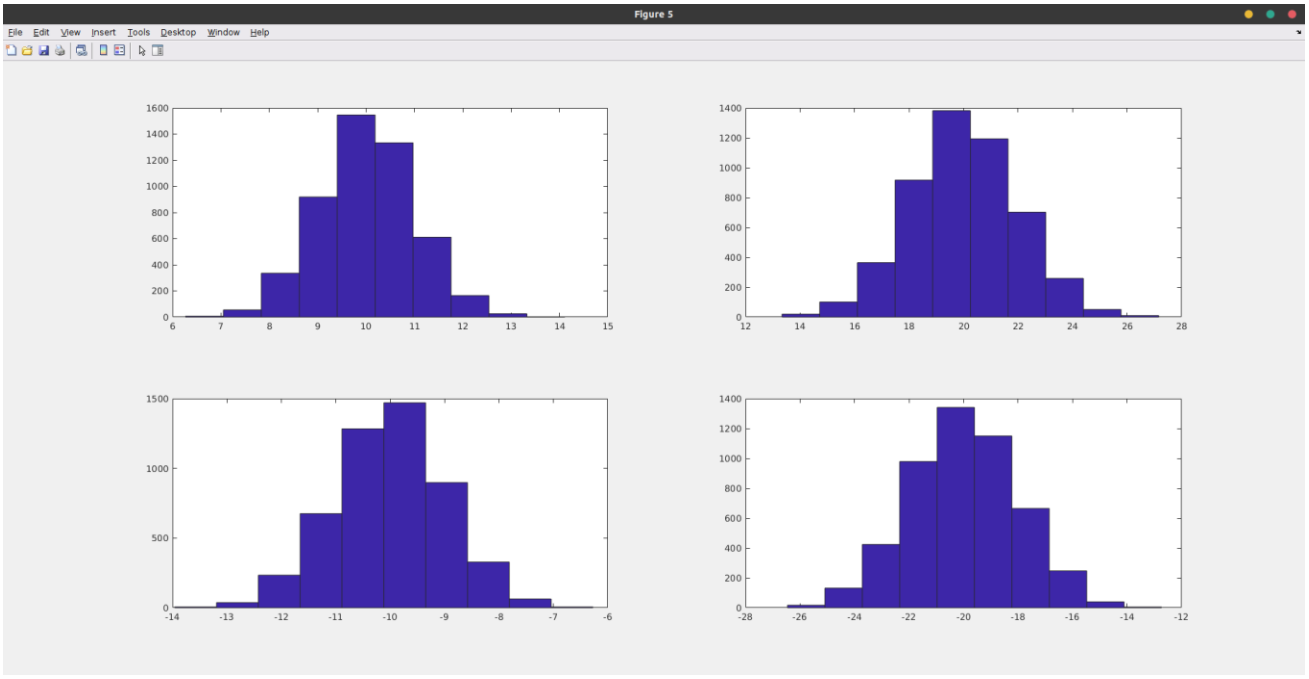
Just like the problem 2, I created a vector with size 401 but this time I used rand to take uniformly distributed random numbers.

Problem 4



When we keep mean value zero and keep increasing the variance the spreads. So, the values again gather at 0 but we start to have the values away from the center 0.

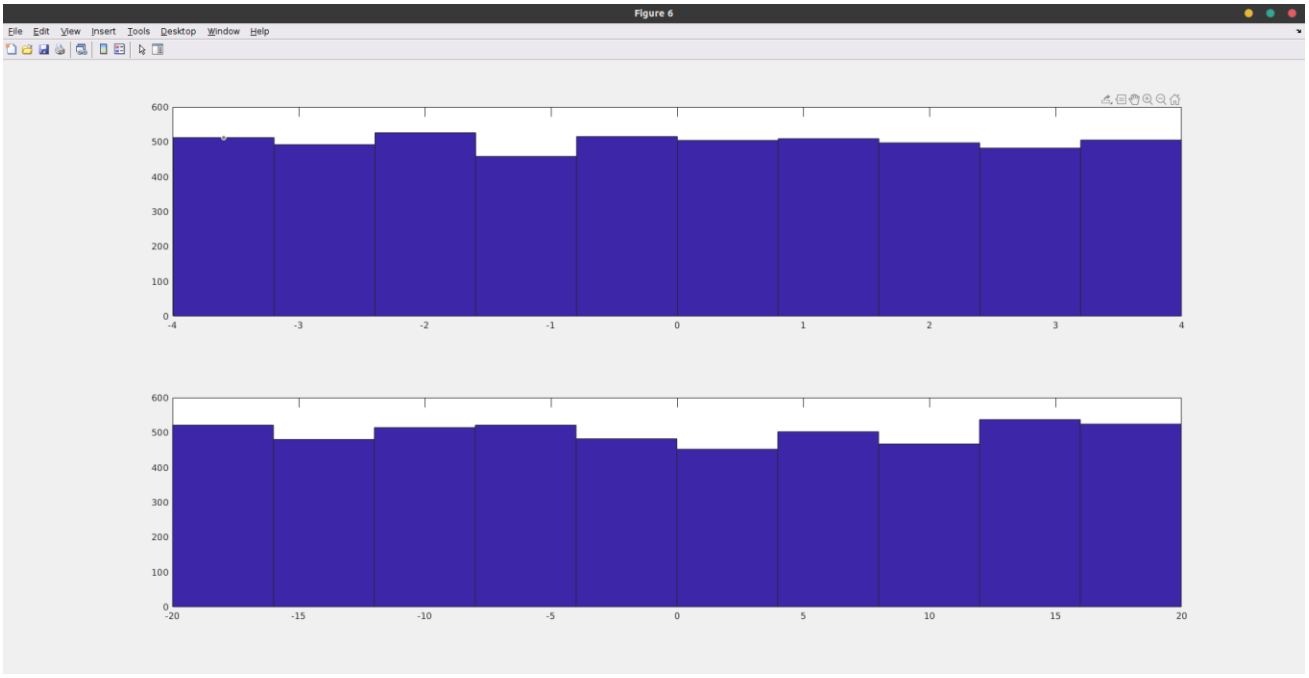
Problem 5



When we keep the variance as it is and change the sign of mean the Gaussian width keeps the same but the values gather on negative sign of the graph that has positive mean. What I mean is that we have two figures (a and c). One of them has mean +10 and one of them has –10 and both have the same variance. So, the two figures look like the same but the values gather exactly on negative sign of the each other.

Figure b and d have the same attributes.

Problem 6

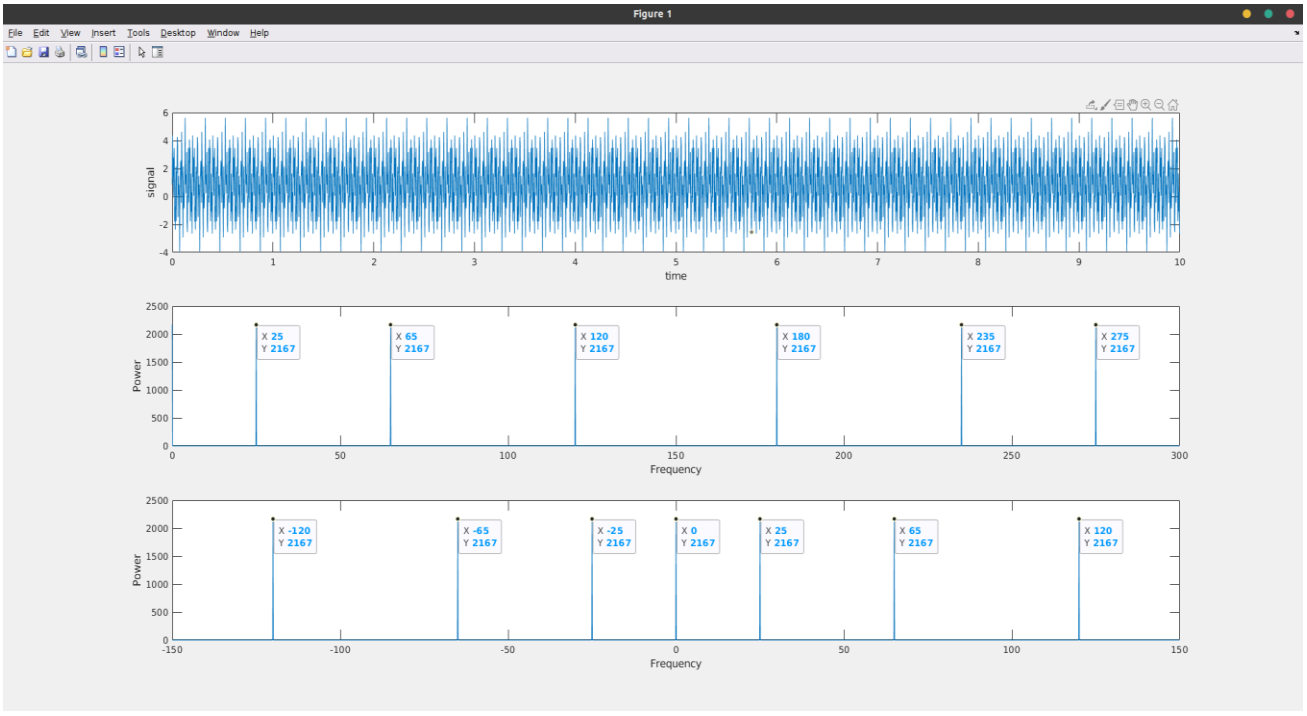


Here as we distribute values evenly the columns have the same values nearly but we expand the axis in second figure.

What I have learned from problems (1-6) is:

1. How to generate random numbers according to given requirements
2. How the gaussian's figure is moving with different mean and variance value.
3. How to generate time vector and set the increasing value
4. How to take transpose of a vector
5. Why it is important to have the same size f we want to multiple 2 vector or matrix.
6. How uniformly distributed random number and Gaussian distributed random number take form if we put them into a figure.
7. How to generate uniformly distributed random number between 0 and 1 and zero-mean, unit variance the Gaussian distributed random number.
8. How to use subplot, plot, and figure functions of MATLAB.

Problem 7



Mathematical formula of the signal:

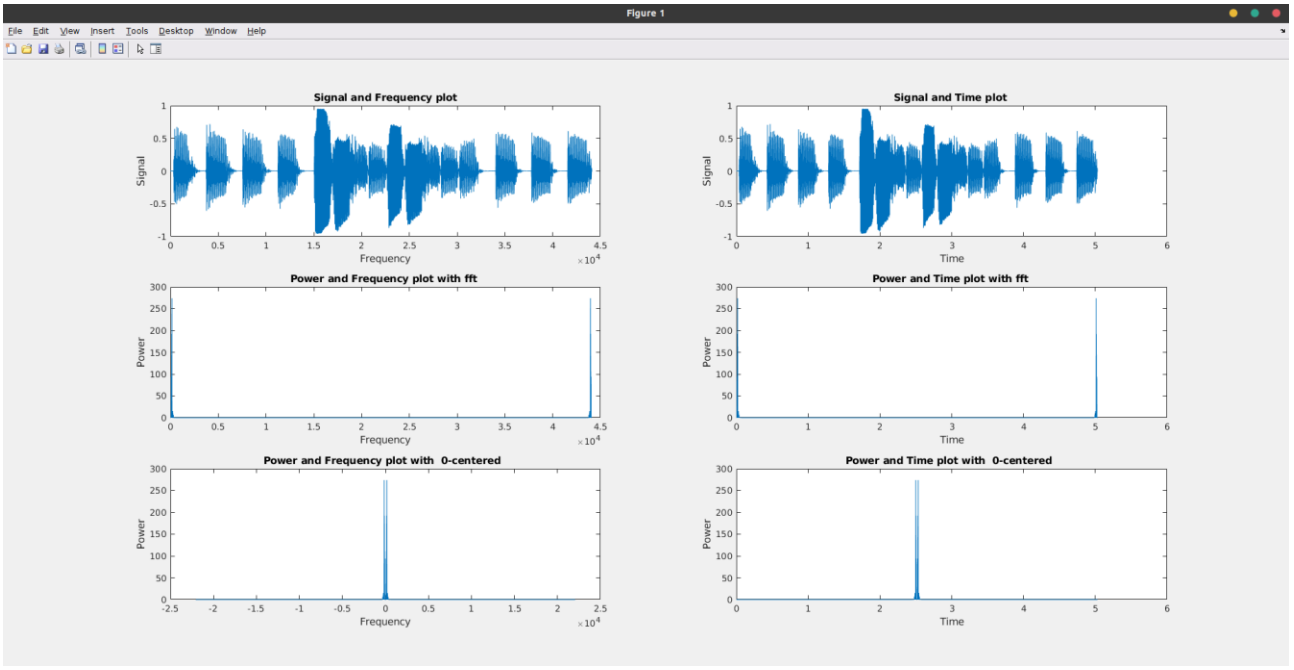
The points (25, -25, 120, -120, 65, -65, 0) are where the power gets value so the signal can be written in cos form

$$\cos(\omega t) = \frac{1}{2}(e^{j\omega t} + e^{-j\omega t})$$

By using this formula, we can combine – and + sign signals and write the formula as

$$x(t) = 2167 + 2 * 2167 * cos(2\pi 25t) + 2 * 2167 * cos(2\pi 65t) + 2 * 2167 * cos(2\pi 120t)$$

Problem 8



The left column is how signal and power values is changing based on frequency and the right column is how signal and power values is changing as time goes

Problem 9

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Mean : 124.042511 standart deviation 47.855598.
Minimum value : 25.000000 and its index 1608.000000 .
Maximum value :  245.000000 and its index 202514.000000 .
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