Dominik Ciesiołkiewicz 44289 – Sprawozdanie lab 5 – poprawione

W porównaniu do mojego wcześniejszego kodu uległa zmianie jedna zmienna w wyznaczaniu AM która była tam niepoprawnie, usunąłem phi z sygnału informacyjnego oraz zmieniłem częstotliwość fs oraz F dla zwiększenia czytelności. Moja odpowiedź do zadania 3 znajduje się w zakomentowanej sekcji kodu.

Kod:

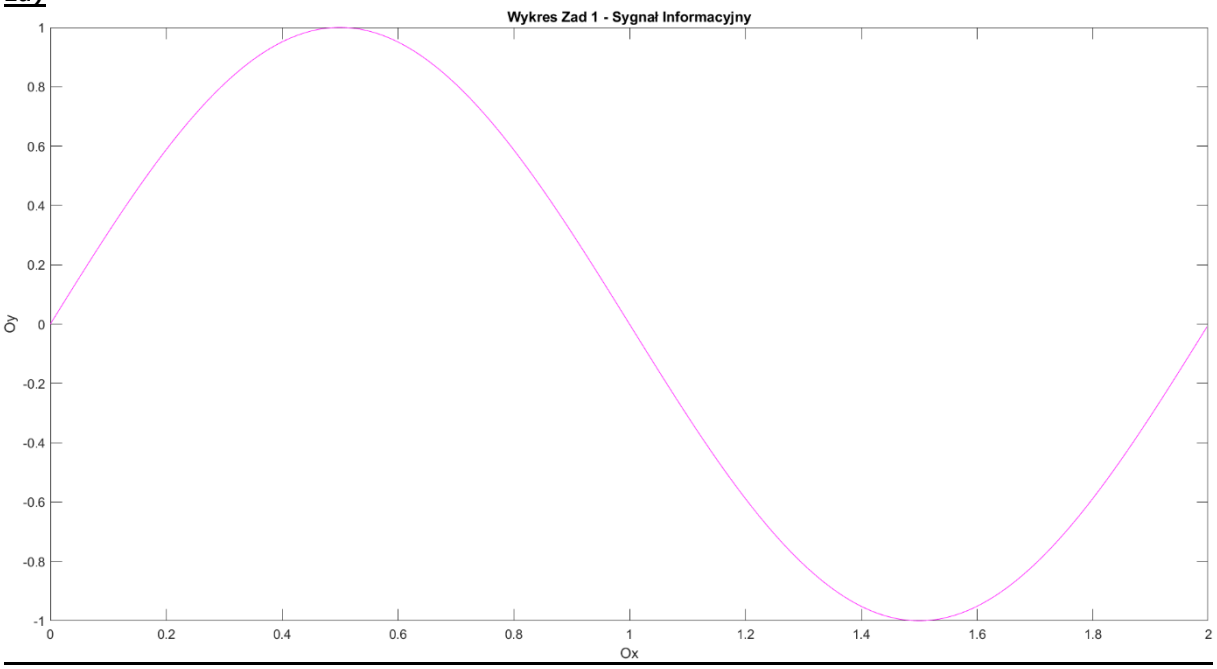
```
#include <iostream>
#include <complex>
#include <fstream>

#define _USE_MATH_DEFINES

double pi = 3.14159265359;

using namespace std;

complex<double>* DFT(const double* tab, int N)
{
	complex<double>* tab2 = new complex<double>[N];

	for (int k = 0; k < N; k++)
	{
		tab2[k] = 0;
		complex<double> WN = cos(tab[k]) + 1i * sin(tab[k]);

		for (int n = 0; n < N; n++)
		{
			tab2[k] += tab[n] * pow(WN, -k * n);
		}
	}

	return tab2;
}

double ton_prosty(double a, double F, double t)
{
	//cout << a << " " << F << " " << t << endl;
	return a * sin(2 * pi * F * t);
}

int main()
{
	double a = 1;//volty
	double A = 2;
	double F = 0.5;
	double phi = 2 * pi;
	double fs = 300;// (?)
	double Ts = 1 / fs;

	//double kA = 0.5, kp = 1.5; //(a)
	//double kA = 10, kp = 3; //(b)
	double kA = 90, kp = 99; //(c)

	ofstream saveOX("zad1OX.txt");
	ofstream saveTonProsty("zad1sig.txt");
	ofstream saveM("zad1M.txt");
	ofstream saveZa("zad1Za.txt");
```

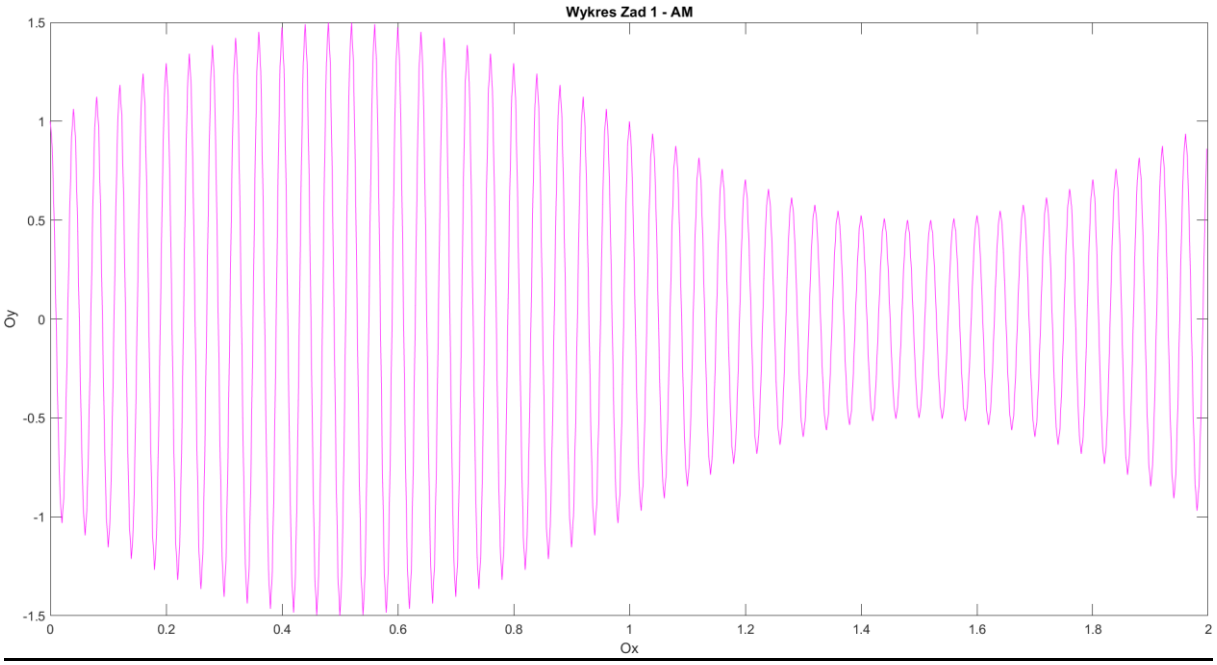
```
ofstream saveZp("zad1Zp.txt");

int count = 0;

for (double i = 0; i < A; i = i + Ts)
{
	count++;
}

double* sig = new double[count];
double* Za = new double[count];
double* Zp = new double[count];
int ilosc = count;
count = 0;

double fn = 50 / double(ilosc);
//cout << fn << endl;


for (double i = 0; i < A; i = i + Ts)
{
	sig[count] = ton_prosty(a, F, i);
	saveOX << i << endl;
	saveTonProsty << sig[count] << endl;

	Za[count] = (kA * sig[count] + 1) * cos(2 * pi * fn * count);
	saveZa << Za[count] << endl;
	Zp[count] = cos(2 * pi * fn * i + kp * sig[count]);
	saveZp << Zp[count] << endl;

	count++;
}

//edit do zad 3
/*
double famin, famax, Wa;


for (double i = 0; i < A; i = i + Ts)
{
	sig[count] = ton_prosty(a, F, i);
	saveOX << i << endl;
	saveTonProsty << sig[count] << endl;

	Za[count] = (kA * sig[count] + 1) * cos(2 * pi * fn * count);
	if (Za[count] < -3)
		Za[count] = -3;
	saveZa << Za[count] << endl;

	if (count == 0)
	{
		famin = Za[count];
		famax = Za[count];
	}
	else
	{
		if (Za[count] < famin)
		{
			famin = Za[count];
		}
		if (Za[count] > famax)
		{
```

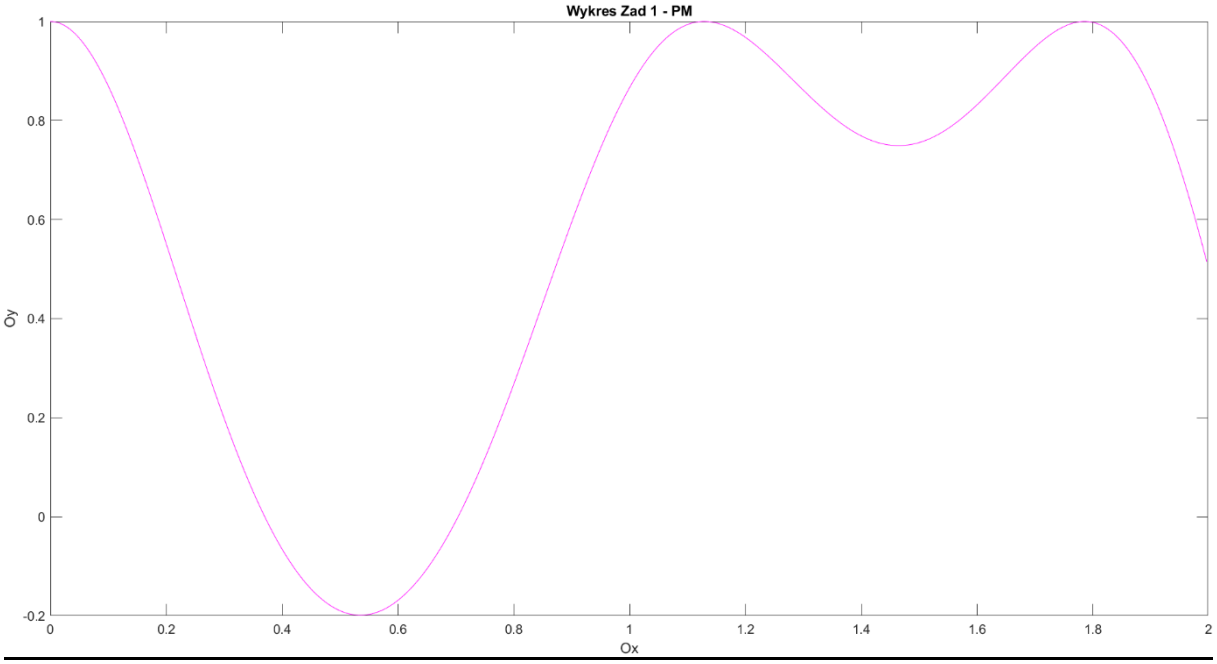
```
                        famax = Za[count];
                }
        }

        Zp[count] = cos(2 * pi * fn * i + kp * sig[count]);
        saveZp << Zp[count] << endl;

        count++;
    }

    Wa = famax - famin;
    cout << "Szerokosc pasma sygnalu: " << Wa << endl;

    //a: Zmodulowana amplituda: 2.99901
    //b: Zmodulowana amplituda: 13.9803
    //c: Zmodulowana amplituda: 93.8224      */

    //zad2
    complex<double>* DFTvalues = DFT(Za, count);

    ofstream saveSpectrum("zad2Spectrum.txt");
    ofstream saveMprim("zad2Mprim.txt");

    double* M = new double[ilosc];
    double* Mprim = new double[ilosc];

    for (int i = 0; i < count; i++)
    {
        M[i] = sqrt(pow(real(DFTvalues[i]), 2) + pow(imag(DFTvalues[i]), 2));
        saveSpectrum << M[i] << endl;
        Mprim[i] = 10 * log10(M[i]);
        saveMprim << Mprim[i] << endl;
    }

    //zamkniecie strumieni

    saveSpectrum.close();
    saveMprim.close();
    saveOX.close();
    saveTonProsty.close();
    saveM.close();
    saveZa.close();
    saveZp.close();

    return 0;
}
```

Wykresy:

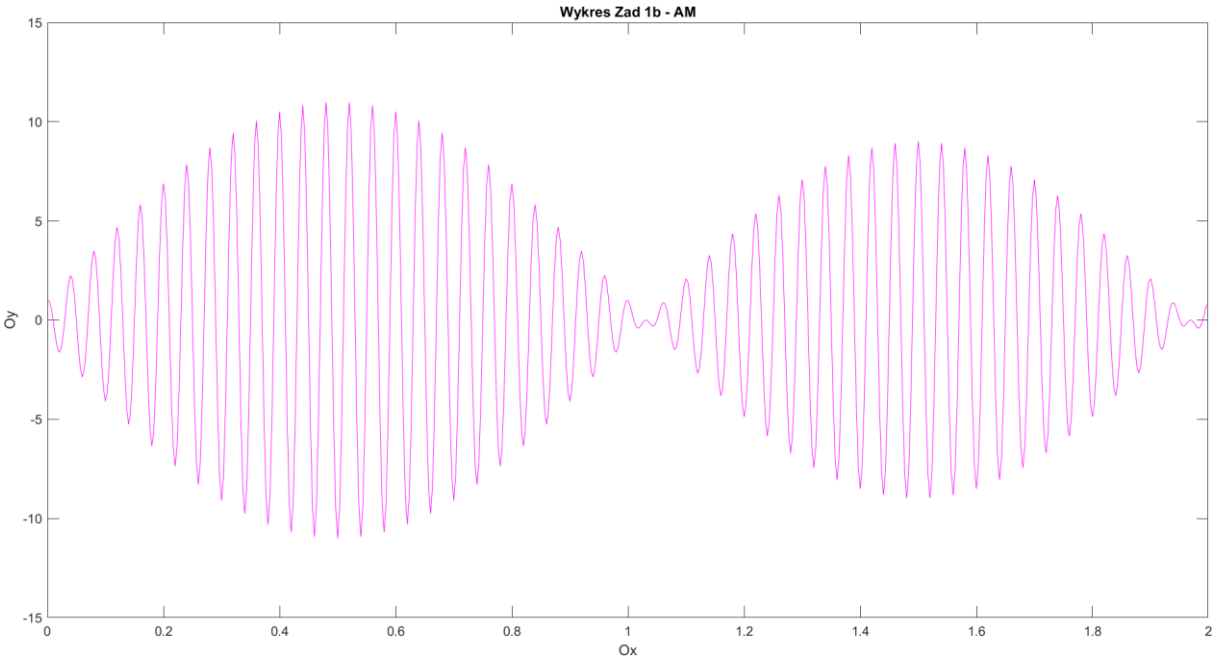
1a)

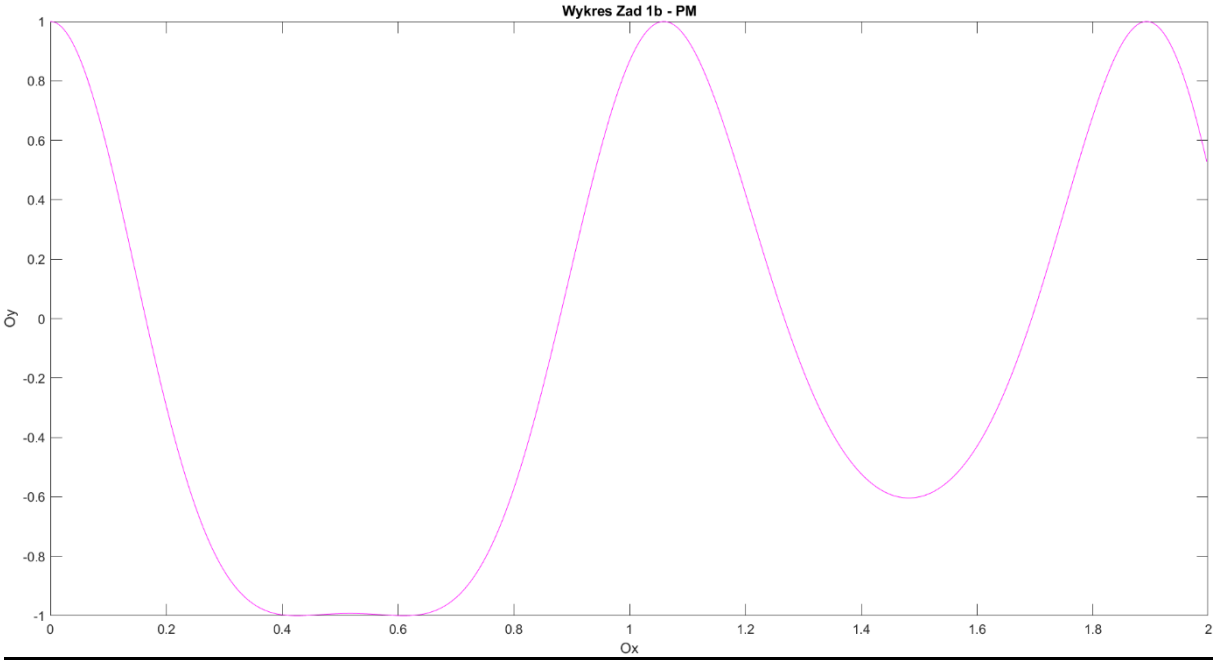

Wykres Zad 1 - Sygnał Informacyjny
Oy
Ox
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2


Wykres Zad 1 - AM
Oy
Ox
1.5
1
0.5
0
-0.5
-1
-1.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

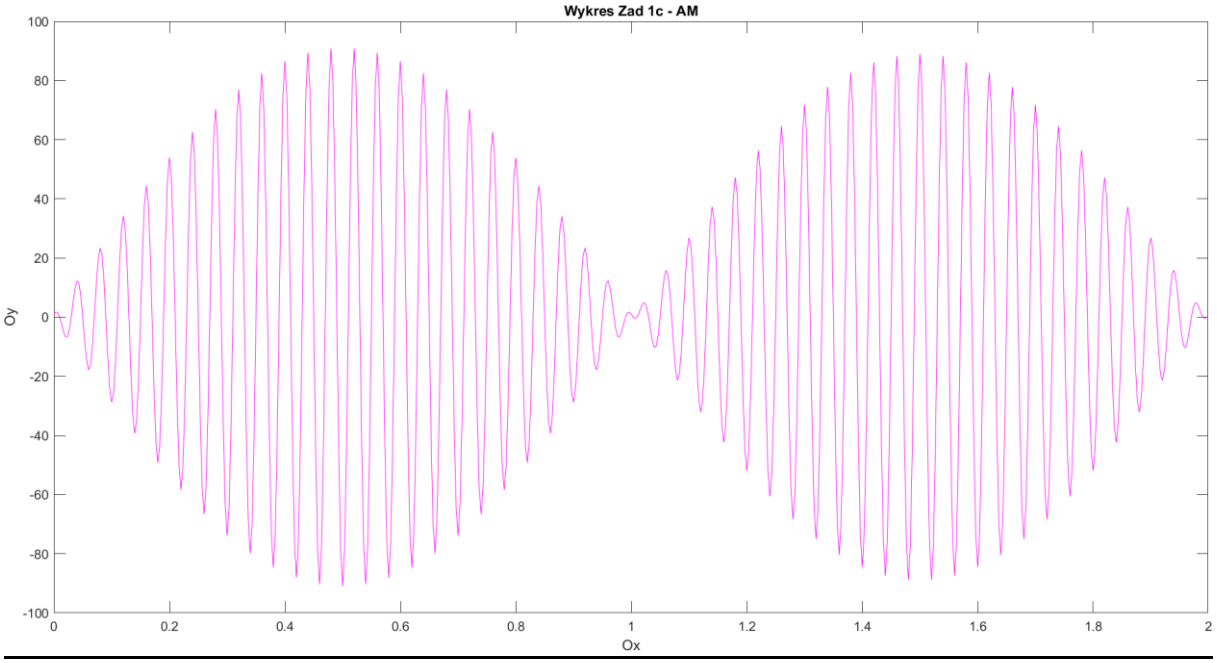

Wykres Zad 1 - PM
Oy
Ox
1
0.8
0.6
0.4
0.2
0
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

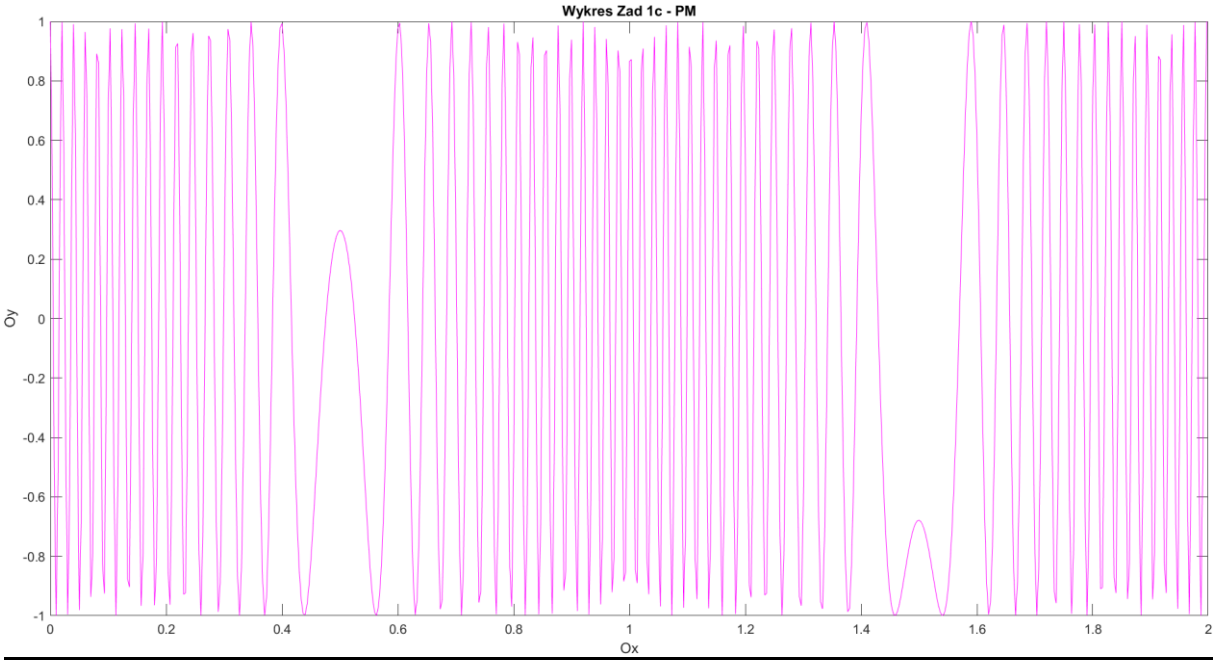
1b)


Wykres Zad 1b - AM
Oy
Ox
15
10
5
0
-5
-10
-15
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

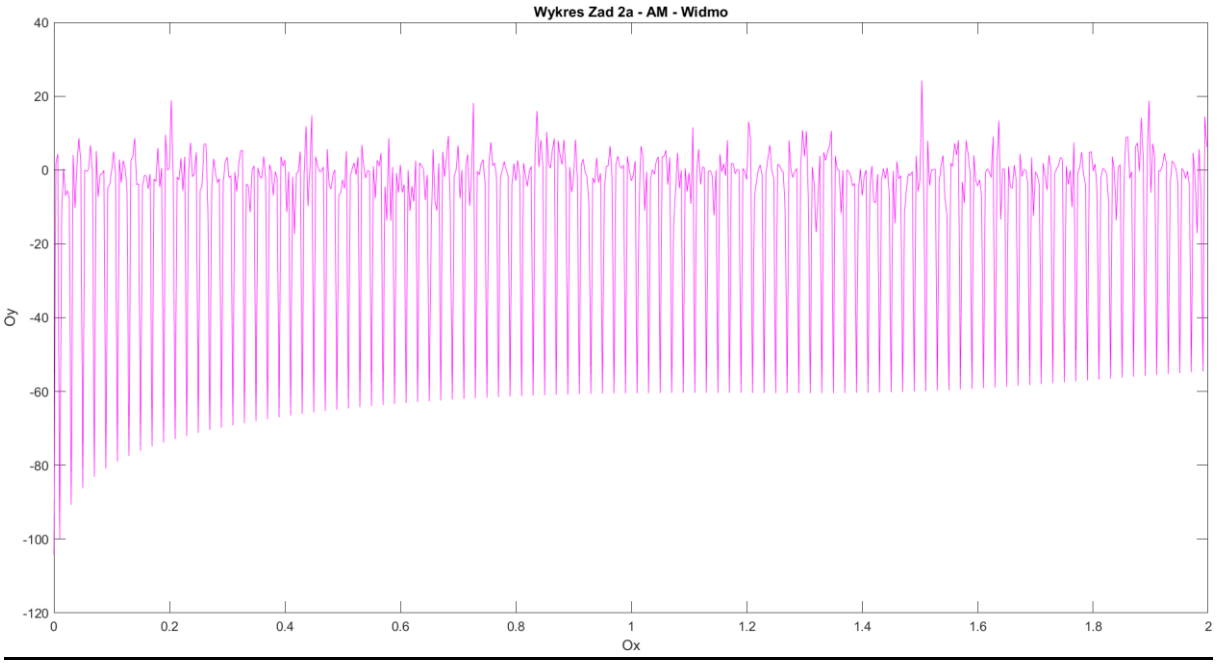

Wykres Zad 1b - PM
Oy
Ox
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

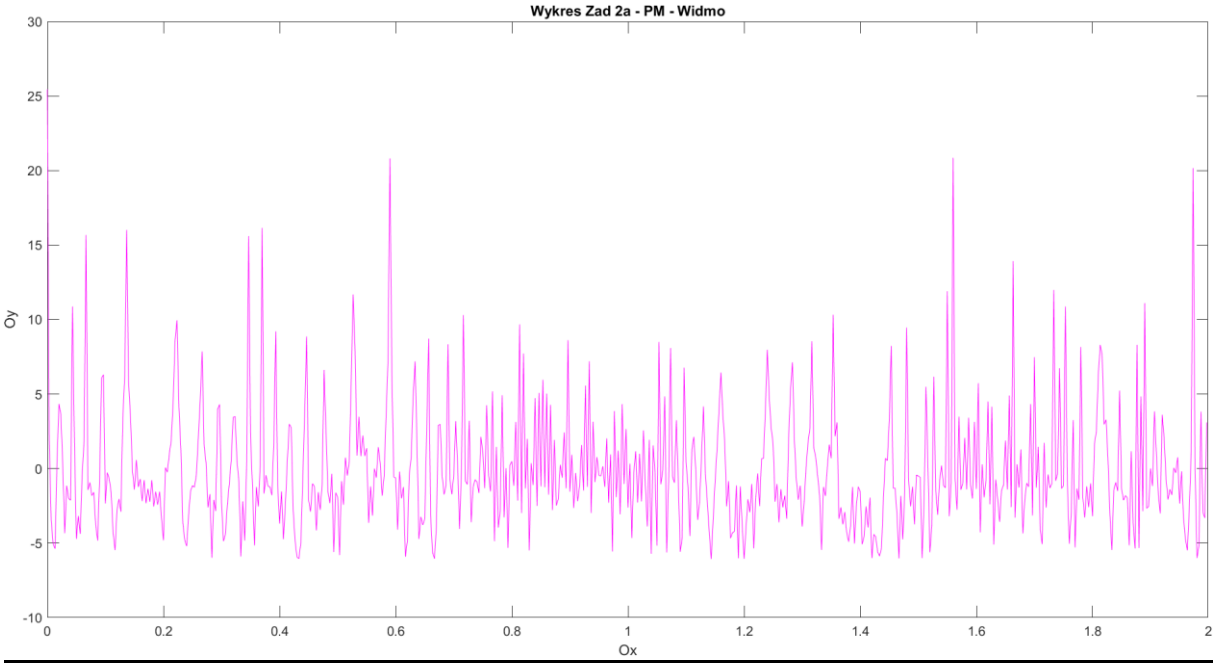
1c)


Wykres Zad 1c - AM
Oy
Ox
100
80
60
40
20
0
-20
-40
-60
-80
-100
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

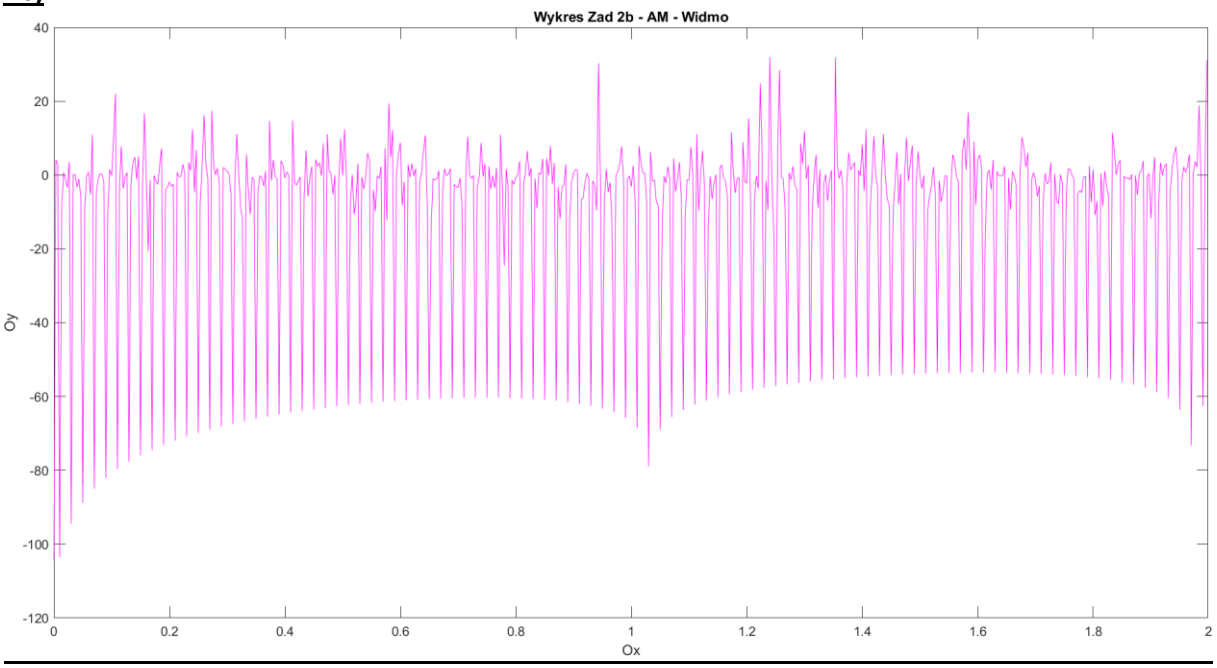

Wykres Zad 1c - PM
Oy
Ox
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

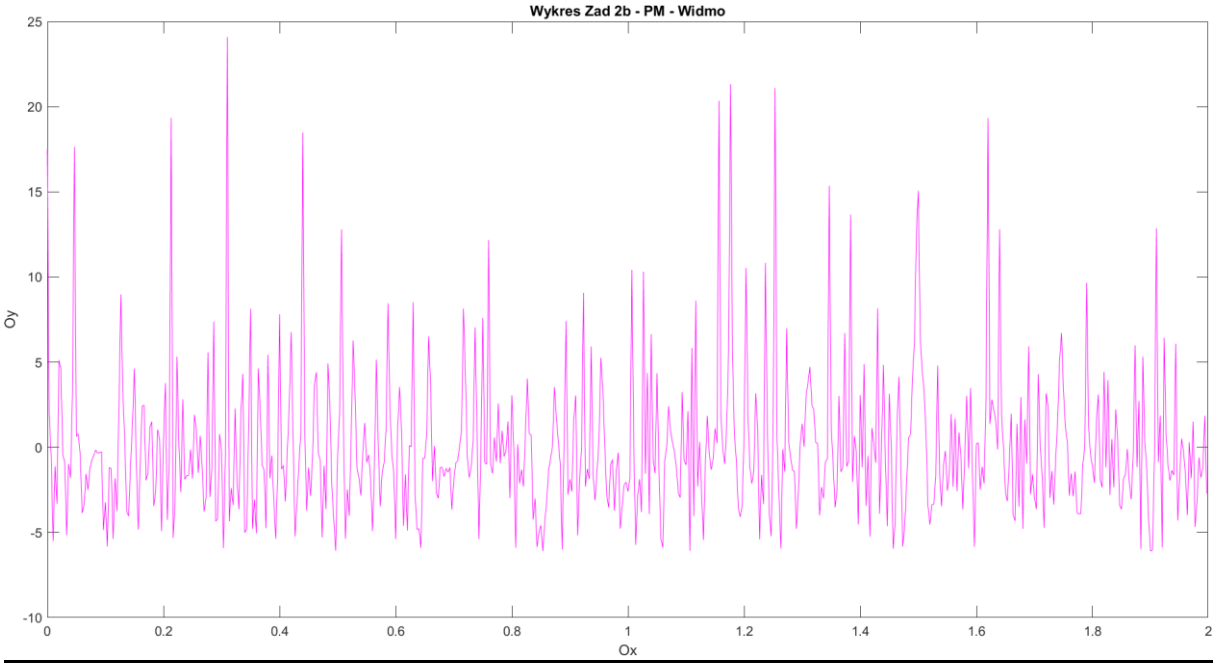
2a)


Wykres Zad 2a - AM - Widmo
Oy
Ox
40
20
0
-20
-40
-60
-80
-100
-120
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

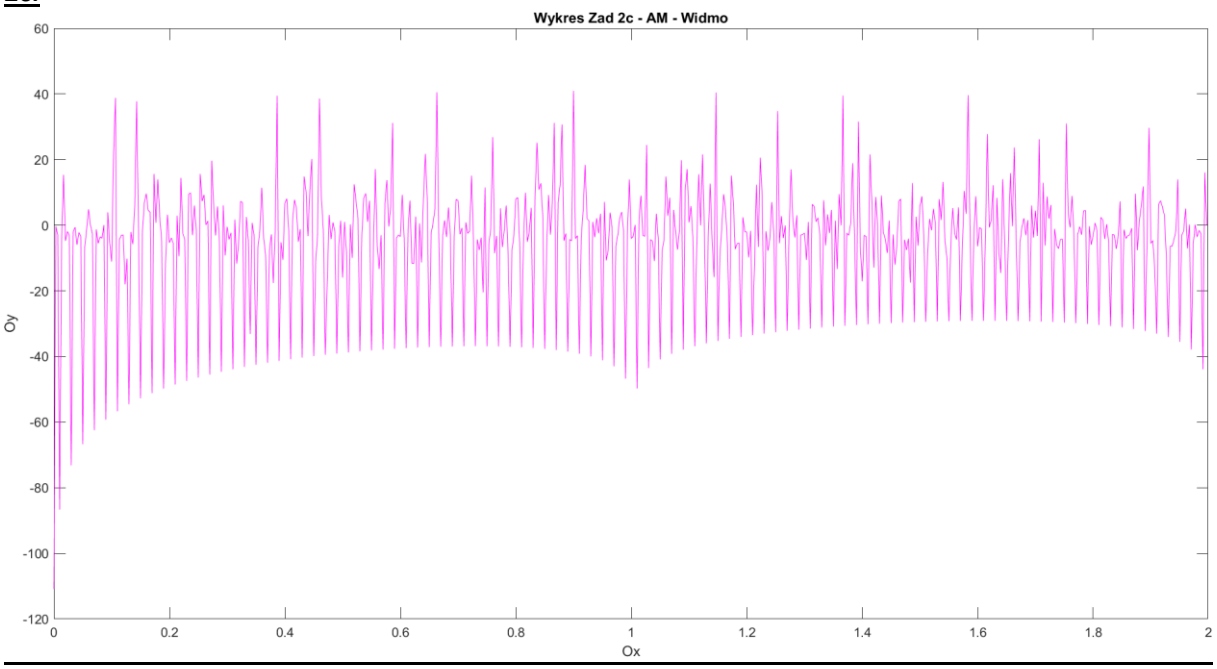

Wykres Zad 2a - PM - Widmo
Oy
Ox
30
25
20
15
10
5
0
-5
-10
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

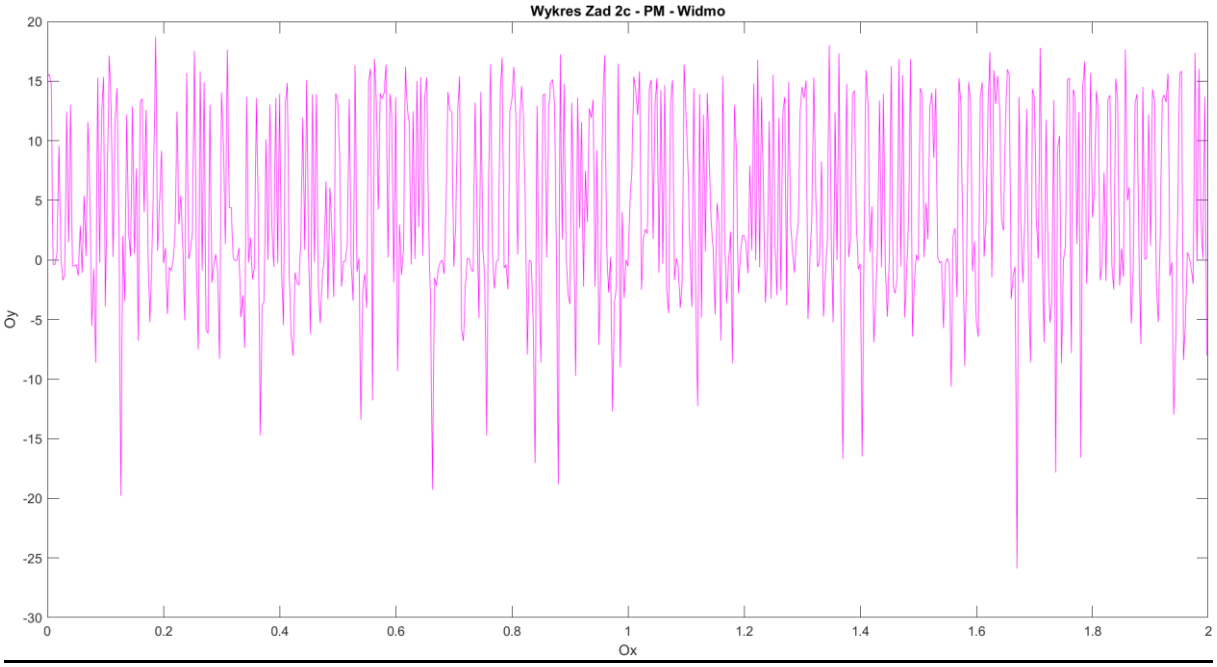
2b)


Wykres Zad 2b - AM - Widmo
Oy
Ox
40
20
0
-20
-40
-60
-80
-100
-120
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2


Wykres Zad 2b - PM - Widmo
Oy
Ox
25
20
15
10
5
0
-5
-10
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

2c:


Wykres Zad 2c - AM - Widmo
Oy
Ox
60
40
20
0
-20
-40
-60
-80
-100
-120
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2


Wykres Zad 2c - PM - Widmo
Oy
Ox
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2