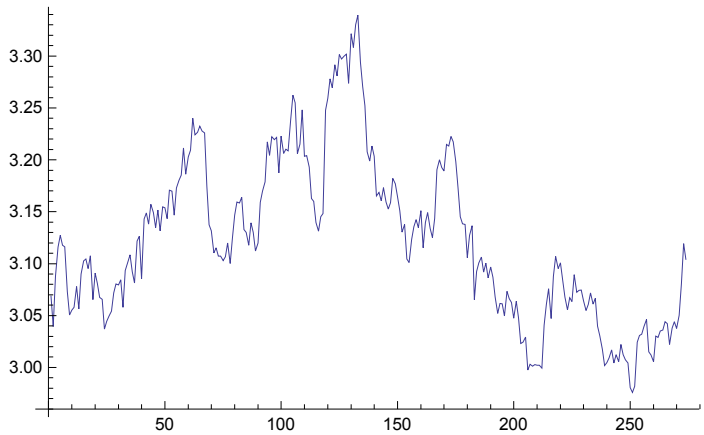
Wszystko ;)

```
SetDirectory[NotebookDirectory[]]
```

Wartosci

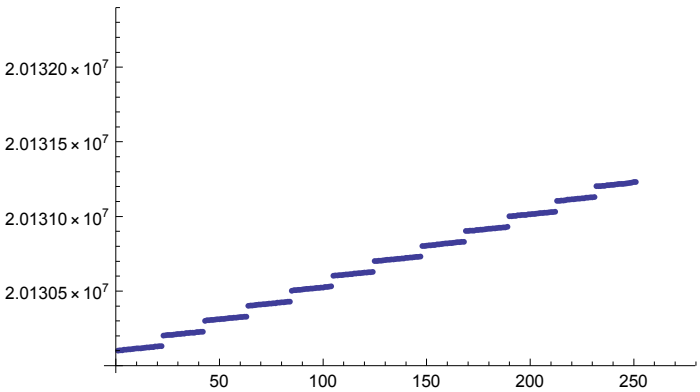
```
wartosci = ReadList["wartosci1.txt"][[1]]
ListPlot[wartosci, Joined → True]
```

```
{3.0686, 3.0393, 3.0878, 3.1158, 3.1272, 3.1177, 3.1161, 3.073, 3.0505, 3.0553, 3.0579,
 3.0781, 3.0565, 3.0901, 3.1027, 3.1046, 3.0952, 3.1077, 3.0653, 3.0908, 3.0807,
 3.0675, 3.0655, 3.0369, 3.0443, 3.0493, 3.0542, 3.0717, 3.0803, 3.0794, 3.0843,
 3.058, 3.0933, 3.1014, 3.1086, 3.0922, 3.0815, 3.1218, 3.1264, 3.0853, 3.143, 3.1488,
 3.1381, 3.1572, 3.1491, 3.1346, 3.1517, 3.1315, 3.1546, 3.1538, 3.1432, 3.1708,
 3.1699, 3.1466, 3.1729, 3.1802, 3.1853, 3.2113, 3.1863, 3.2029, 3.2093, 3.2401,
 3.2242, 3.2264, 3.2323, 3.2279, 3.2258, 3.1747, 3.1375, 3.1317, 3.1104, 3.1154,
 3.1071, 3.1071, 3.103, 3.1065, 3.12, 3.1002, 3.1249, 3.1467, 3.1593, 3.1583, 3.164,
 3.1328, 3.1302, 3.1177, 3.1393, 3.1302, 3.1123, 3.12, 3.1591, 3.1698, 3.1787,
 3.2173, 3.2045, 3.2223, 3.2195, 3.2215, 3.1873, 3.2229, 3.2062, 3.2101, 3.2087,
 3.2387, 3.2623, 3.2548, 3.2059, 3.2153, 3.248, 3.2034, 3.2039, 3.1929, 3.1628,
 3.1599, 3.1395, 3.1312, 3.1453, 3.1483, 3.2477, 3.2592, 3.2779, 3.2695, 3.2916,
 3.2809, 3.3016, 3.297, 3.2998, 3.3018, 3.2736, 3.3215, 3.3084, 3.33, 3.3395,
 3.2942, 3.2706, 3.2521, 3.2076, 3.1987, 3.2132, 3.2034, 3.1653, 3.1686, 3.1606,
 3.1732, 3.1593, 3.1527, 3.1586, 3.1823, 3.1768, 3.1644, 3.151, 3.1304, 3.1378,
 3.1046, 3.101, 3.1234, 3.1357, 3.1423, 3.1348, 3.1511, 3.1152, 3.1397, 3.1491,
 3.1339, 3.125, 3.1435, 3.1906, 3.2, 3.1925, 3.1893, 3.2147, 3.2133, 3.2227, 3.2173,
 3.1981, 3.173, 3.1452, 3.1383, 3.1378, 3.1056, 3.1274, 3.1364, 3.0653, 3.0926,
 3.1009, 3.1063, 3.0918, 3.1006, 3.0864, 3.0969, 3.087, 3.0677, 3.0522, 3.0617,
 3.0614, 3.0497, 3.0733, 3.0661, 3.0624, 3.0474, 3.0639, 3.0477, 3.0231, 3.0244,
 3.0293, 2.9975, 3.003, 3.0012, 3.0028, 3.0022, 3.0021, 2.9993, 3.0406, 3.0608,
 3.0759, 3.0472, 3.0877, 3.1069, 3.0952, 3.1009, 3.0841, 3.0677, 3.0556, 3.0671,
 3.0635, 3.0893, 3.0725, 3.0742, 3.0745, 3.0643, 3.0548, 3.0606, 3.0717, 3.0611,
 3.0667, 3.0398, 3.0304, 3.0175, 3.0017, 3.0046, 3.0091, 3.017, 3.0042, 3.0122,
 3.0056, 3.0223, 3.0123, 3.0075, 3.0043, 2.9804, 2.9759, 2.9819, 3.0244, 3.0309,
 3.0321, 3.0393, 3.0462, 3.015, 3.0121, 3.0056, 3.0303, 3.0291, 3.0351, 3.0361,
 3.0442, 3.0422, 3.0223, 3.0379, 3.044, 3.0375, 3.0502, 3.0803, 3.1193, 3.1043}
```



```
czas = ReadList["czas1.txt"][[1]]
ListPlot[czas]
```

```
{20130102, 20130103, 20130104, 20130107, 20130108, 20130109, 20130110, 20130111,
 20130114, 20130115, 20130116, 20130117, 20130118, 20130121, 20130122, 20130123,
 20130124, 20130125, 20130128, 20130129, 20130130, 20130131, 20130201, 20130204,
 20130205, 20130206, 20130207, 20130208, 20130211, 20130212, 20130213, 20130214,
 20130215, 20130218, 20130219, 20130220, 20130221, 20130222, 20130225, 20130226,
 20130227, 20130228, 20130301, 20130304, 20130305, 20130306, 20130307, 20130308,
 20130311, 20130312, 20130313, 20130314, 20130315, 20130318, 20130319,
 20130320, 20130321, 20130322, 20130325, 20130326, 20130327, 20130328,
 20130329, 20130402, 20130403, 20130404, 20130405, 20130408, 20130409,
 20130410, 20130411, 20130412, 20130415, 20130416, 20130417, 20130418,
 20130419, 20130422, 20130423, 20130424, 20130425, 20130426, 20130429,
 20130430, 20130502, 20130506, 20130507, 20130508, 20130509, 20130510,
 20130513, 20130514, 20130515, 20130516, 20130517, 20130520, 20130521, 20130522,
 20130523, 20130524, 20130527, 20130528, 20130529, 20130531, 20130603,
 20130604, 20130605, 20130606, 20130607, 20130610, 20130611, 20130612,
 20130613, 20130614, 20130617, 20130618, 20130619, 20130620, 20130621, 20130624,
 20130625, 20130626, 20130627, 20130628, 20130701, 20130702, 20130703, 20130704,
 20130705, 20130708, 20130709, 20130710, 20130711, 20130712, 20130715, 20130716,
 20130717, 20130718, 20130719, 20130722, 20130723, 20130724, 20130725, 20130726,
 20130729, 20130730, 20130731, 20130801, 20130802, 20130805, 20130806, 20130807,
 20130808, 20130809, 20130812, 20130813, 20130814, 20130816, 20130819, 20130820,
 20130821, 20130822, 20130823, 20130826, 20130827, 20130828, 20130829, 20130830,
 20130902, 20130903, 20130904, 20130905, 20130906, 20130909, 20130910, 20130911,
 20130912, 20130913, 20130916, 20130917, 20130918, 20130919, 20130920, 20130923,
 20130924, 20130925, 20130926, 20130927, 20130930, 20131001, 20131002, 20131003,
 20131004, 20131007, 20131008, 20131009, 20131010, 20131011, 20131014, 20131015,
 20131016, 20131017, 20131018, 20131021, 20131022, 20131023, 20131024, 20131025,
 20131028, 20131029, 20131030, 20131031, 20131104, 20131105, 20131106, 20131107,
 20131108, 20131112, 20131113, 20131114, 20131115, 20131118, 20131119, 20131120,
 20131121, 20131122, 20131125, 20131126, 20131127, 20131128, 20131129, 20131202,
 20131203, 20131204, 20131205, 20131206, 20131209, 20131210, 20131211,
 20131212, 20131213, 20131216, 20131217, 20131218, 20131219, 20131220,
 20131223, 20131224, 20131227, 20131230, 20131231, 20140102, 20140103,
 20140107, 20140108, 20140109, 20140110, 20140113, 20140114, 20140115,
 20140116, 20140117, 20140120, 20140121, 20140122, 20140123, 20140124,
 20140127, 20140128, 20140129, 20140130, 20140131, 20140203, 20140204}
```



FFT

```
FFT[table_, ω_] :=
 Chop[Sum[table[[i, 2]] * Exp[-i * 2 π * ω * table[[i, 1]]], {i, Length[table]}]]

FFTALL[data_] := (

  iFFTALL = 0;
  dw = 1/Length[data] * 1/(data[[2, 1]] - data[[1, 1]]);
  wmax = 1/(data[[2, 1]] - data[[1, 1]]);
  wyniki = {};
  For[ω = -dw, ω < wmax, ω += dw;
   wyniki = Join[wyniki, {{ω, Abs[FFT[data, ω]]}}];
   iFFTALL++;
   If[Mod[iFFTALL, 100] == 0, Print[ω, " ", wmax]]
  ];
  wyniki)
```

Czas

```
Rok[2013] := 0;
Rok[2014] := 365;
Miesiac[1] = 0;
Miesiac[2] = Miesiac[1] + 31;
Miesiac[3] = Miesiac[2] + 28;
Miesiac[4] = Miesiac[3] + 31;
Miesiac[5] = Miesiac[4] + 30;
Miesiac[6] = Miesiac[5] + 31;
Miesiac[7] = Miesiac[6] + 30;
Miesiac[8] = Miesiac[7] + 31;
Miesiac[9] = Miesiac[8] + 31;
Miesiac[10] = Miesiac[9] + 30;
Miesiac[11] = Miesiac[10] + 31;
Miesiac[12] = Miesiac[11] + 30;

Miesiac[12] + 31
```

365

```
Dni[md_] := Rok[IntegerPart[md / 10000]] + Miesiac[
    IntegerPart[md / 100] - IntegerPart[md / 10000] * 100] + FractionalPart[md / 100] * 100
Dni[20130101]
Dni[20131231]
Dni[20140101]
```

```
1
```

```
365
```

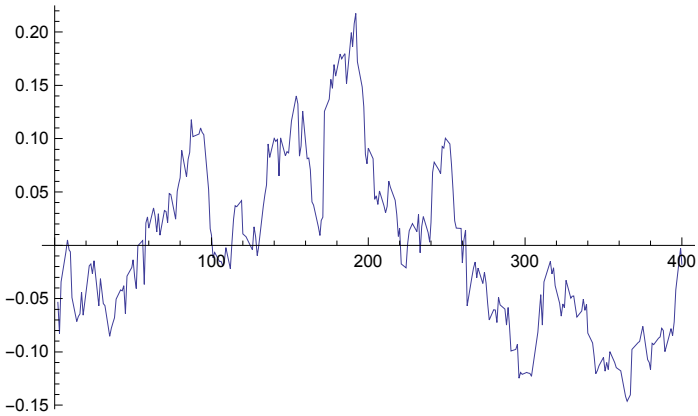
```
366
```

Konwersja wynikow

```
Length[wartosci] == Length[czas]
srednia = Mean[wartosci]
dane = Table[{Dni[czas[[i]]], wartosci[[i]] - srednia}, {i, Length[czas]}];
dane2 = Table[{Dni[czas[[i]]], wartosci[[i]]}, {i, Length[czas]}];
ListPlot[dane, Joined → True]
```

```
True
```

```
3.12214
```



Obliczenia

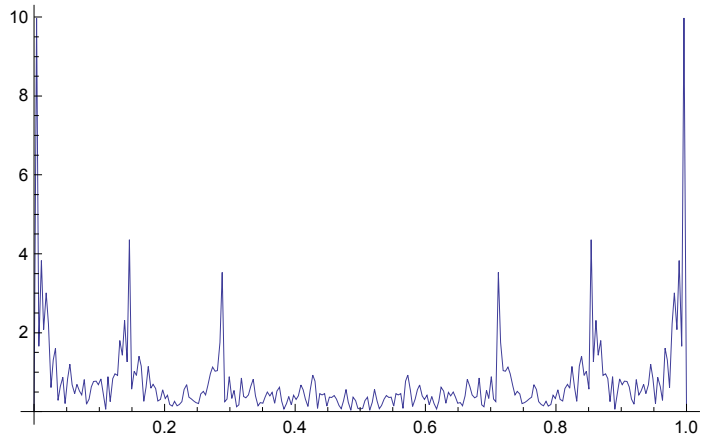
```
wynik = FFTALL[dane];
```

$$\frac{99}{274}\ 1$$

$$\frac{199}{274}\ 1$$

Prezentacja wyniku

```
ListPlot[wynik[[ ;; IntegerPart[Length[wynik]]]], Joined → True, PlotRange → All]
```



Dodatek: przeliczenie częstotliwości na jednostkę czasu

```
IleDni[f_] := Print[N[1/f], " dnia"]
```

```
IleDni[0.15]
```

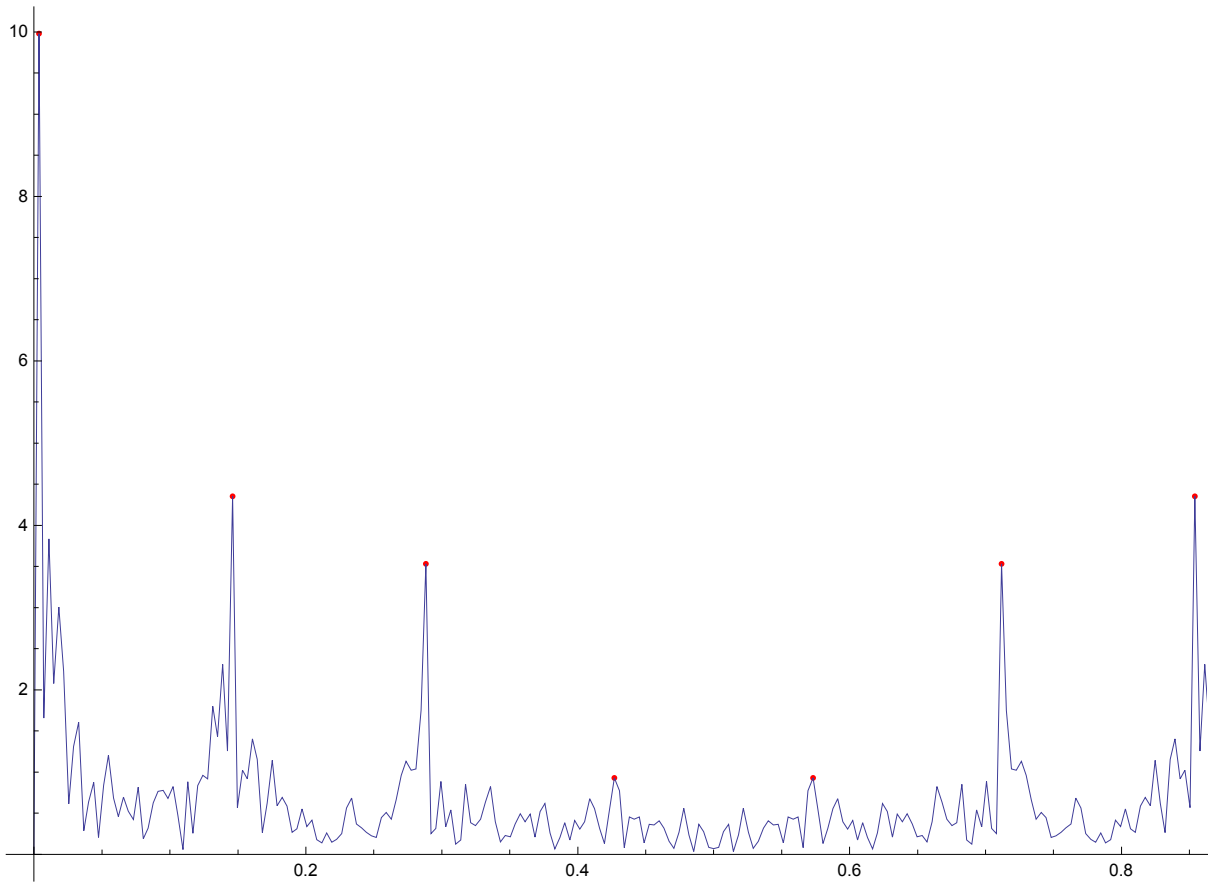
```
6.66667 dnia
```

Znalezienie pików

```
granica = 20;
mx = 0;
w2 = DeleteCases[Table[
     old = mx;
     tab = wynik[[i - granica ;; i + granica]];
     mx = Max[tab[[All, 2]]];
     If[
      wynik[[i, 2]] == mx,
      wynik[[i]],

      If[old ≠ mx,
       pozycja = Position[tab[[All, 2]], mx][[1, 1]];
       tab[[pozycja]]
       ,
       Null]
     ]
     , {i, granica + 1, Length[wynik] - granica}],
    Null];

Show[
      ListPlot[w2, PlotRange → All, PlotStyle → Red],
      ListPlot[wynik, PlotRange → All, Joined → True]
]
Length[wynik]
Length[w2]
TableForm[
 ai = Table[
    If[i == 0,
     {"f [1/d]", "t [d]", "A [-]"},
     {N[w2[[i, 1]]], N[w2[[i, 1]]^-1], w2[[i, 2]]}
    ],
    {i, 0, Length[w2]}]
]
```



275

13

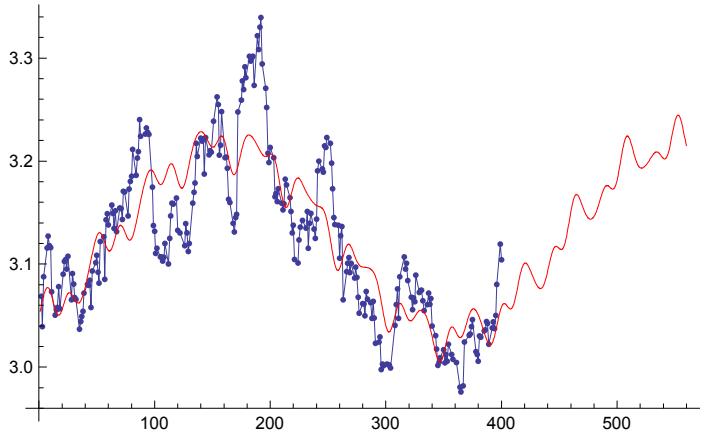
f [1/d]	t [d]	A [-]
0.00364964	274.	9.97898
0.145985	6.85	4.3542
0.145985	6.85	4.3542
0.288321	3.46835	3.53284
0.288321	3.46835	3.53284
0.427007	2.34188	0.927799
0.427007	2.34188	0.927799
0.572993	1.74522	0.927799
0.711679	1.40513	3.53284
0.711679	1.40513	3.53284
0.854015	1.17094	4.3542
0.854015	1.17094	4.3542
0.99635	1.00366	9.97898

Dopasowanie krzywej do otrzymanych wyników

```
Freq = {1, 2, 4, 6};
Freq = Table[ai[[Freq[[i]] + 1, 1]], {i, Length[Freq]}];
Equation =
 A0 + Total[Table[A1[i] * Sin[(Freq[[i]] + δ[i]) * x + ϕ1[i]], {i, Length[Freq]}]]
Vars = Join[Table[A1[i], {i, Length[Freq]}], Table[{δ[i], 0.0001}, {i, Length[Freq]}]
    (*,Table[{ω1[i],Freq[[i]]},{i,Length[Freq]}]*),
    Table[ϕ1[i], {i, Length[Freq]}], {A0}];
ret = Normal[NonlinearModelFit[dane2, Equation, Vars, x]]
Show[
 ListPlot[dane2, PlotRange → All],
 ListPlot[dane2, Joined → True, PlotRange → All],
 Plot[ret, {x, 1, Max[dane[[All, 1]] + 160}, PlotStyle → Red]
]
```

```
A0 + A1[1] × Sin[x (0.00364964 + δ[1]) + ϕ1[1]] + A1[2] × Sin[x (0.145985 + δ[2]) + ϕ1[2]] +
 A1[3] × Sin[x (0.288321 + δ[3]) + ϕ1[3]] + A1[4] × Sin[x (0.427007 + δ[4]) + ϕ1[4]]
```

```
3.12326 - 0.00300799 Sin[2.2223 - 0.416513 x] - 0.0923639 Sin[1.02449 - 0.0161506 x] -
 0.0146135 Sin[3.61189 + 0.138319 x] + 0.0116876 Sin[0.0269392 + 0.286776 x]
```



Różnica dni między kupnem 300 $ a dzisiaj

```
Last[dane2][[1]] - Dni[20 131 021]
```

```
106
```