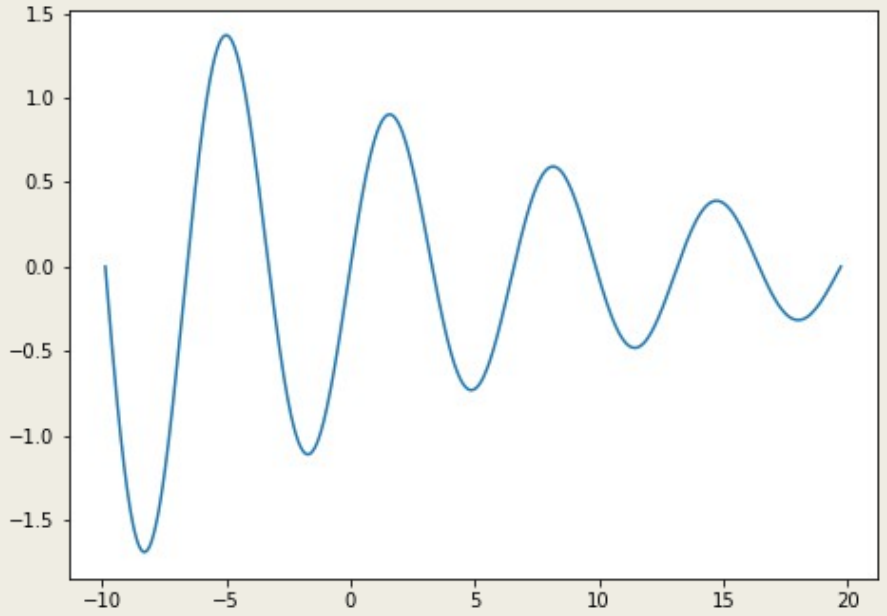
INTERPOLACJA

Bartosz Kucharz

Funkcja do analizy

$$f(x) = \sin\left(\frac{kx}{\pi}\right) \cdot e^{\frac{-mx}{\pi}} \qquad k = 3, m = 0.2, x \in [-pi^2, 2\pi^2]$$



Dokładność interpolacji

```
def max_error(function, x, y):
    return np.max(np.abs(np.vectorize(function)(x) - y))

def var(function, x, y):
    return sum(np.square(np.vectorize(function)(x) - y))/(x.shape[0]-1)
```

Dokładność interpolacji ze względu na sposób interpolacji i dobór węzłów

```
tests(interpolation_lagrange, chebyshev_nodes)
```

Nodes number	15	20	30	45	50	60	70
Var	0.0151145	6.61019e-06	7.11154e-17	5.06687e-31	4.84523e-31	4.64332e-31	5.98507e-31
Max error	0.2461	0.0053456	2.06642e-08	3.55271e-15	3.34455e-15	3.66374e-15	3.77476e-15

```
tests(interpolation_lagrange, uniform_nodes)
```

Nodes number	15	20	30	45	50	60	70
Var	7.5373	0.0581601	6.19281e-10	1.09248e-13	8.67319e-11	7.03845e-05	37.2906
Max error	15.207	1.6453	0.000211509	4.78097e-06	0.000143744	0.125151	116.27

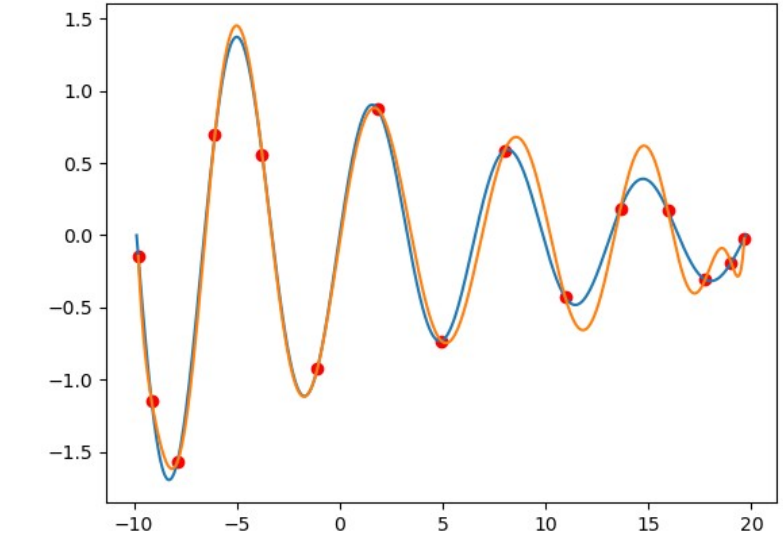
```
tests(interpolation_newton, chebyshev_nodes)
```

Nodes number	15	20	30	45	50	60	70
Var	0.0151145	6.61019e-06	7.85501e-17	1.04503e-15	6.29419e-15	6.18847e-09	284.718
Max error	0.2461	0.0053456	3.76808e-08	4.10027e-07	9.63399e-07	0.00108717	233.949

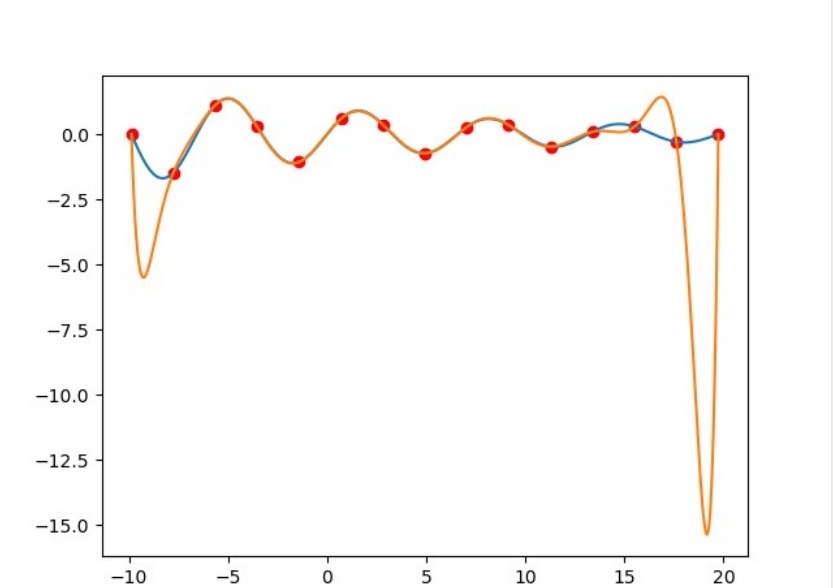
```
tests(interpolation_newton, uniform_nodes)
```

Nodes number	15	20	30	45	50	60	70
Var	7.5373	0.0581601	6.19285e-10	9.48223e-15	1.69895e-11	6.09222e-06	20.8135
Max error	15.207	1.6453	0.000211509	8.66776e-07	4.02277e-05	0.028248	52.5256

Interpolacja Newtona dla 15 węzłów:



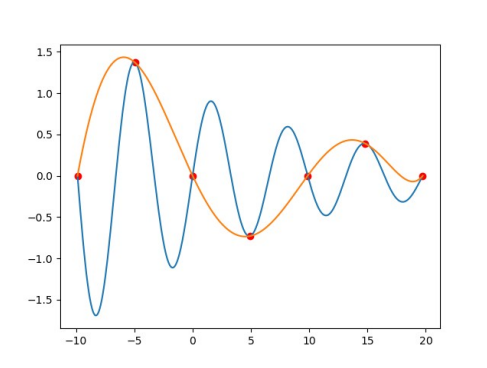
węzły Czebyszewa



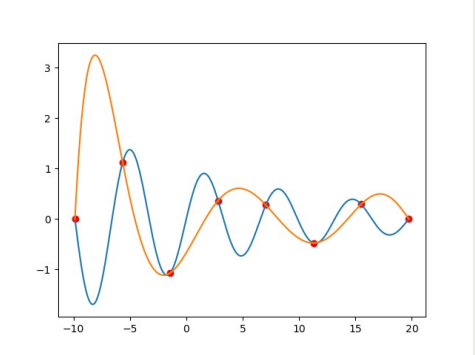
węzły równoodległe

Efekt Runge'go
Interpolacja Newtona

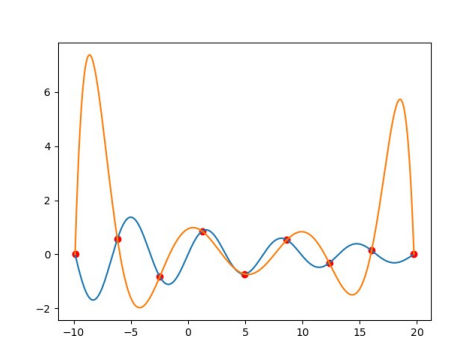
Węzły równoodległe



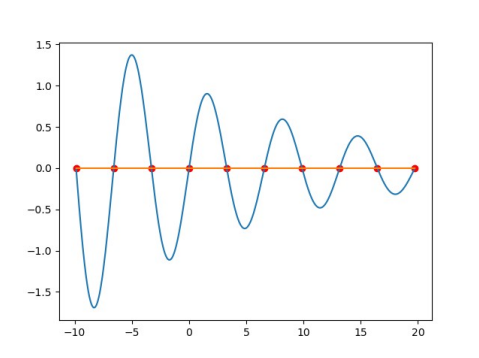
7 węzłów



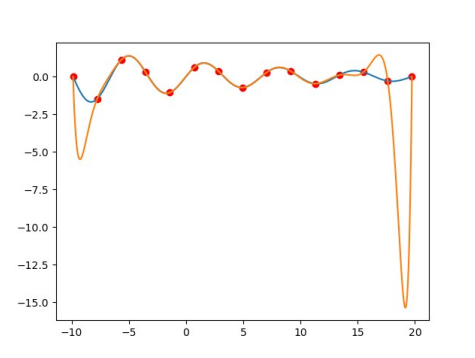
8 węzłów



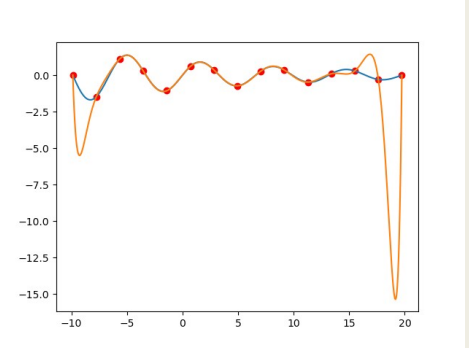
9 węzłów



10 węzłów



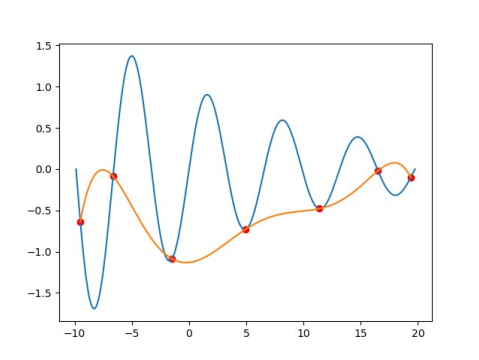
15 węzłów



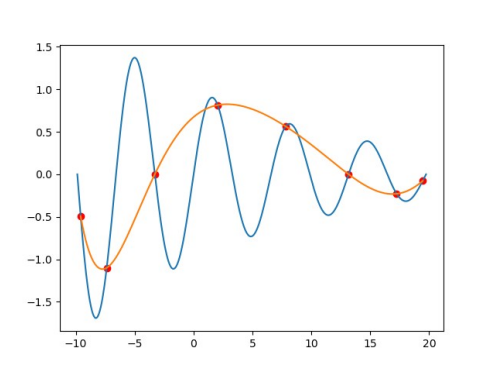
20węzłów

Efekt Runge'go
Interpolacja Newtona

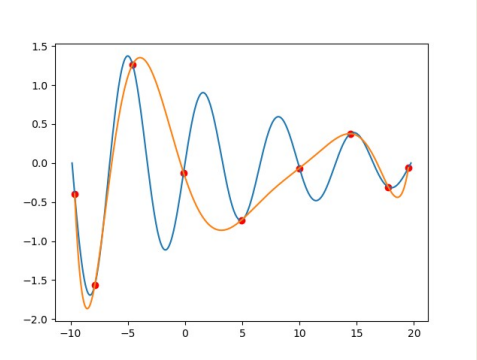
Porównanie z węzłami Czebyszewa



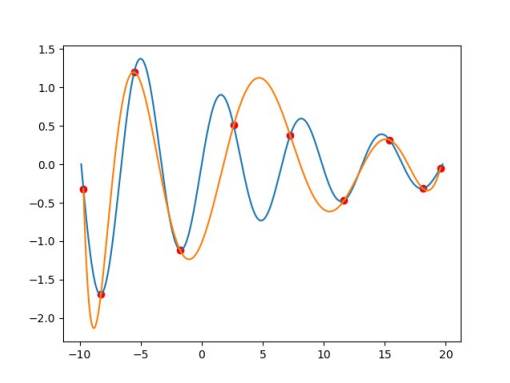
7 węzłów



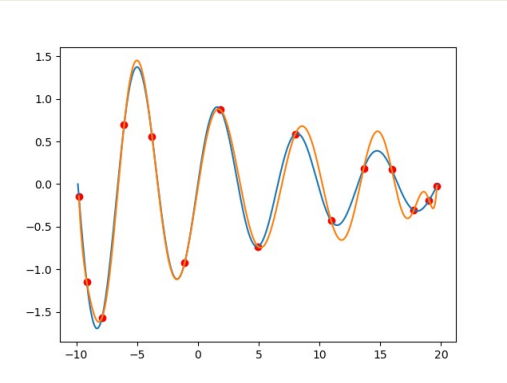
8 węzłów



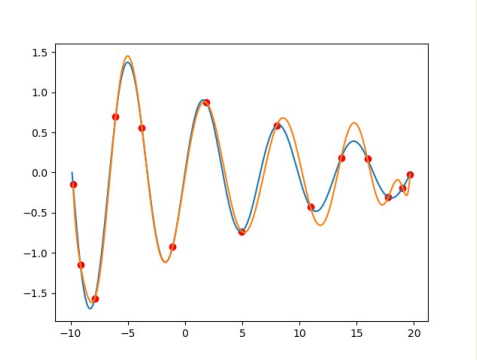
9 węzłów



10 węzłów



15 węzłów



20węzłów