

Przetwarzanie Sygnałów Cyfrowych

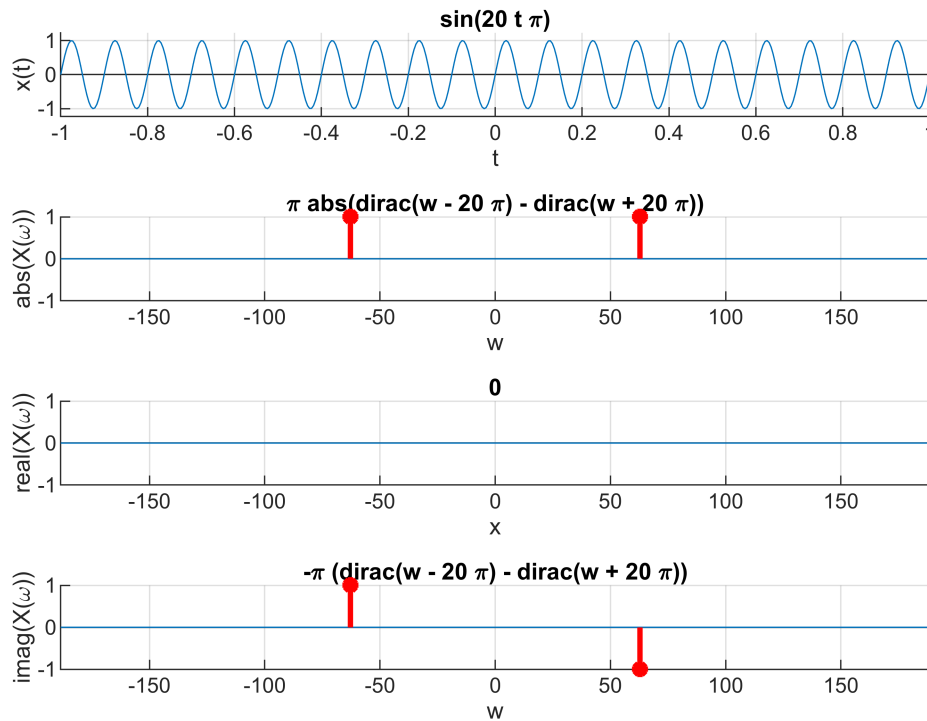
Analiza harmoniczna cz. 2

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Ćwiczenie 1

Transformata fouriera sygnału $\sin(\omega t)$

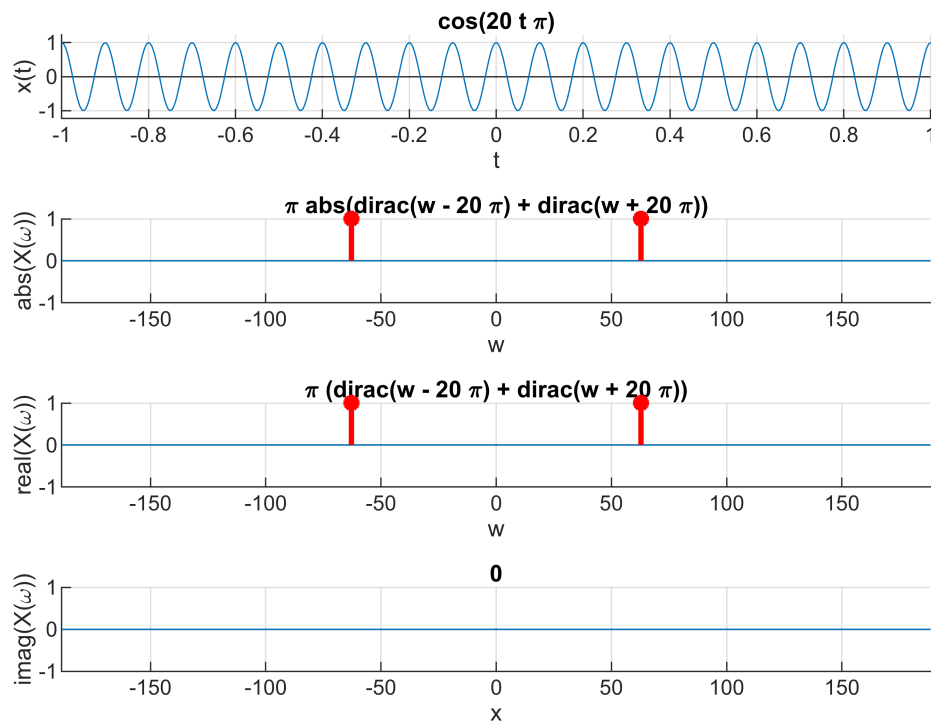
```
syms t
f0 = 10; %Hz
w0 = 2*pi*f0;
x = sin(w0*t);
fourT_dirac(x, f0)
```



Zad 2

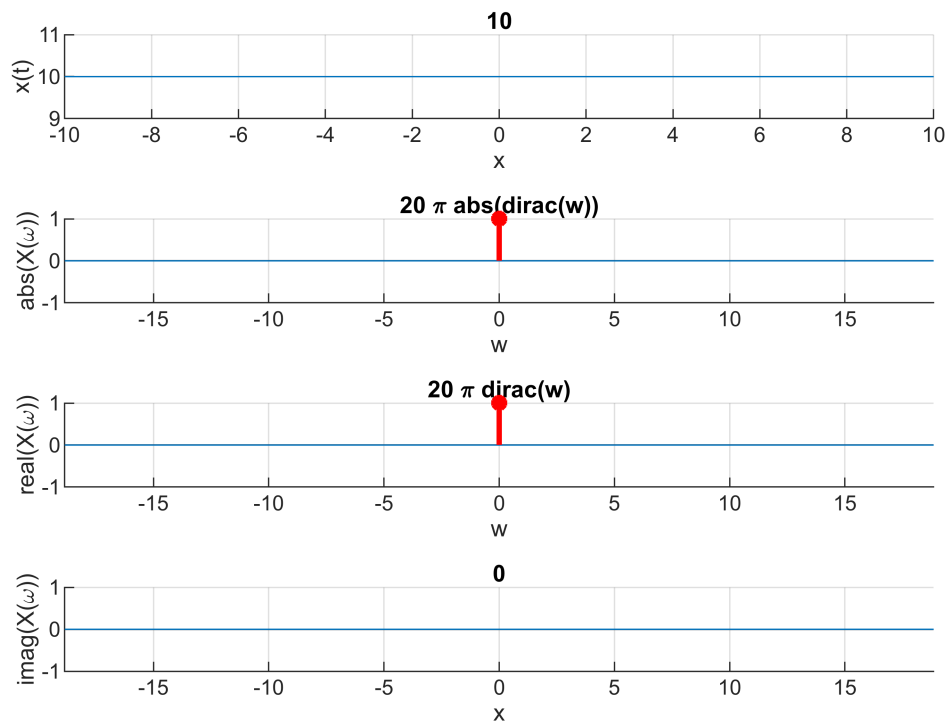
a) sygnał $\cos(\omega_0 t)$

```
f0 = 10; %Hz
w0 = 2*pi*f0;
x = cos(w0*t);
fourT_dirac(x, f0)
```



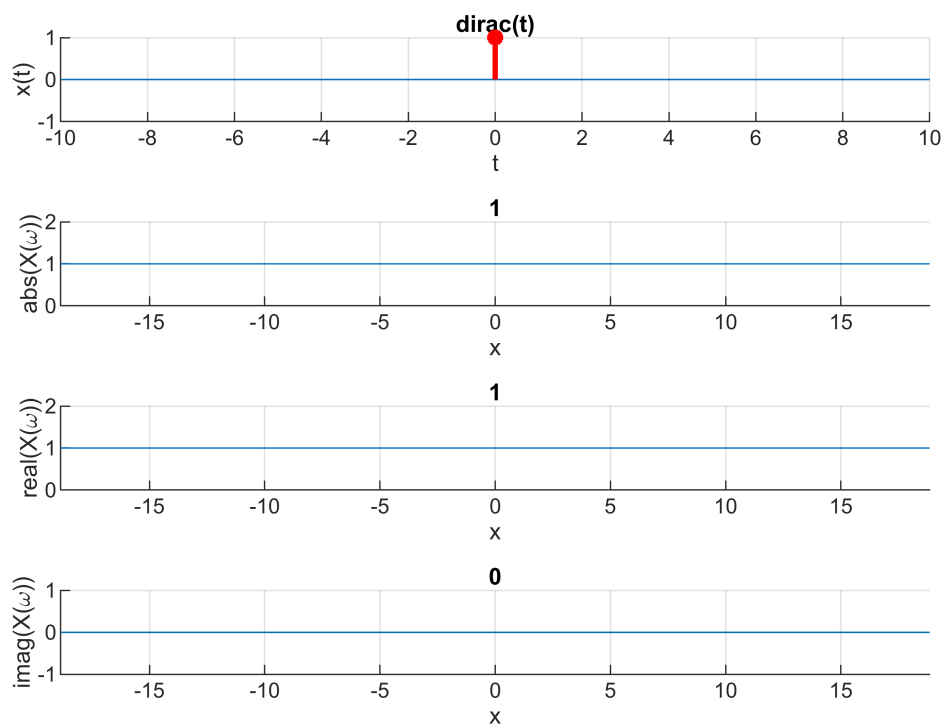
b) sygnał stały o wartości 10 (do jego zdeniowania należy użyć polecenia `sym(10)`)

```
f0 = 1; %Hz
x = sym(10);
fourT_dirac(x, f0)
```



c) skok jednostkowy o amplitudzie 1

```
f0 = 1; %Hz
x = dirac(t);
fourT_dirac(x, f0)
```

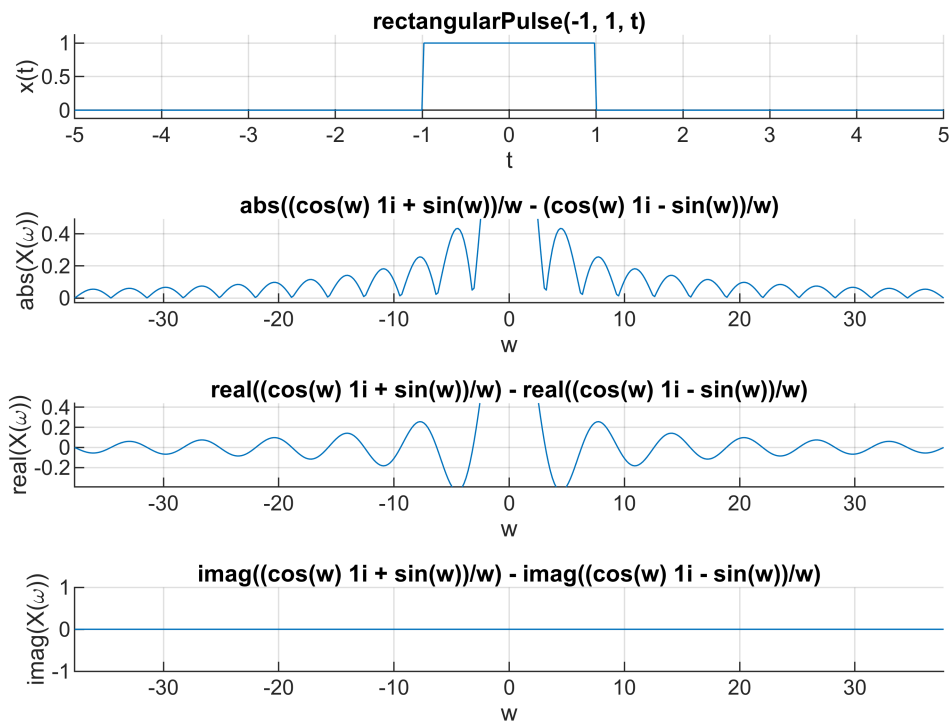


d) impuls prostokątny o amplitudzie 1 oraz czasie trwania $T_i = 2/f_0$

```
f0 = 2;  
x = rectangularPulse(-1, 1, t)
```

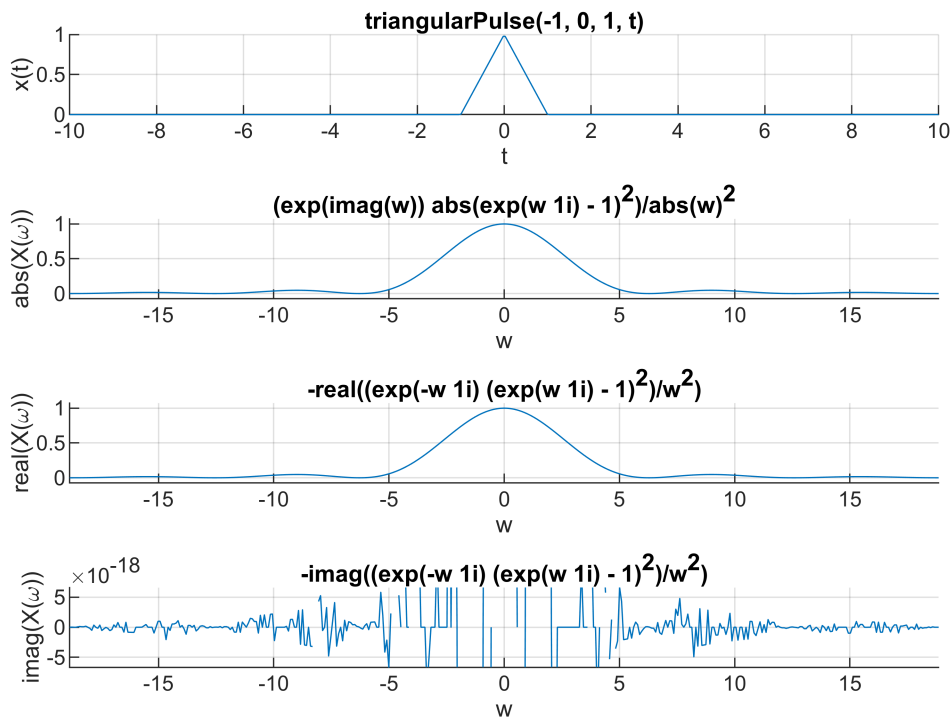
```
x = rectangularPulse(-1, 1, t)
```

```
fourT_cont(x, f0)
```



e) impuls trójkątny (symetryczny) o amplitudzie 1 oraz czasie trwania $T_i = 2/f_0$.

```
f0 = 1;
x = triangularPulse(-1/f0, 1/f0, t);
fourT_cont(x, f0)
```



```
function [] = fourT_dirac(x, f0)

syms w t

w0 = 2*pi*f0;
BND_t = [-10/f0;10/f0]; %20 okresow
t_SMP = [BND_t(1):1/(10*f0):BND_t(2)];
BND_w = [-3*w0;3*w0];
w_SMP = [BND_w(1):w0/10:BND_w(2)];
X_FT = fourier(x);

%plot signal
figure
subplot(4,1,1); ylabel('x(t)'); hold on
ezplot(x,BND_t); hold on; grid on;
v_num = subs(x, t, t_SMP);
n = find(abs(v_num) == inf); % plot dirac (inf)
stem(t_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);

%plot abs of fourier
subplot(4,1,2); ylabel('abs(X(\omega))'); hold on
ezplot(abs(X_FT), BND_w); hold on; grid on
v_num = subs(abs(X_FT), w, w_SMP);
n = find( abs(v_num) == inf ); % plot dirac (inf)
stem(w_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);
```

```

%plot real of fourier
subplot(4,1,3); ylabel('real(X(\omega))'); hold on
ezplot(real(X_FT), BND_w); hold on; grid on;
v_num = subs(real(X_FT), w, w_SMP);
n = find( abs(v_num) == inf); % plot dirac (inf)
stem(w_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);

%plot imag of fourier
subplot(4,1,4); ylabel('imag(X(\omega))'); hold on
ezplot(imag(X_FT), BND_w); hold on; grid on
v_num = subs(imag(X_FT), w, w_SMP);
n = find( abs(v_num) == inf ); % plot dirac (inf)
stem(w_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);
end

function [] = fourT_cont(x, f0)

syms w t

w0 = 2*pi*f0;
BND_t = [-10/f0;10/f0]; %20 okresow
t_SMP = [BND_t(1):1/(10*f0):BND_t(2)];
BND_w = [-3*w0;3*w0];
w_SMP = [BND_w(1):w0/10:BND_w(2)];
X_FT = fourier(x);

%plot signal
figure
subplot(4,1,1); ylabel('x(t)'); hold on
ezplot(x,BND_t); hold on; grid on;
v_num = subs(x, t, t_SMP);
n = find(abs(v_num) == inf); % plot dirac (inf)
stem(t_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);

%plot abs of fourier
subplot(4,1,2); ylabel('abs(X(\omega))'); hold on
ezplot(abs(X_FT), BND_w); hold on; grid on
%v_num = subs(abs(X_FT), w, w_SMP);
%n = find( abs(v_num) == inf ); % plot dirac (inf)
%stem(w_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);

%plot real of fourier

```

```

subplot(4,1,3); ylabel('real(X(\omega))'); hold on
ezplot(real(X_FT), BND_w); hold on; grid on;
%v_num = subs(real(X_FT), w, w_SMP);
%n = find( abs(v_num) == inf); % plot dirac (inf)
%stem(w_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);

%plot imag of fourier
subplot(4,1,4); ylabel('imag(X(\omega))'); hold on
ezplot(imag(X_FT), BND_w); hold on; grid on
%v_num = subs(imag(X_FT), w, w_SMP);
%n = find( abs(v_num) == inf ); % plot dirac (inf)
%stem(w_SMP(n),sign(v_num(n)), 'r*', 'LineWidth', 2);
end

```