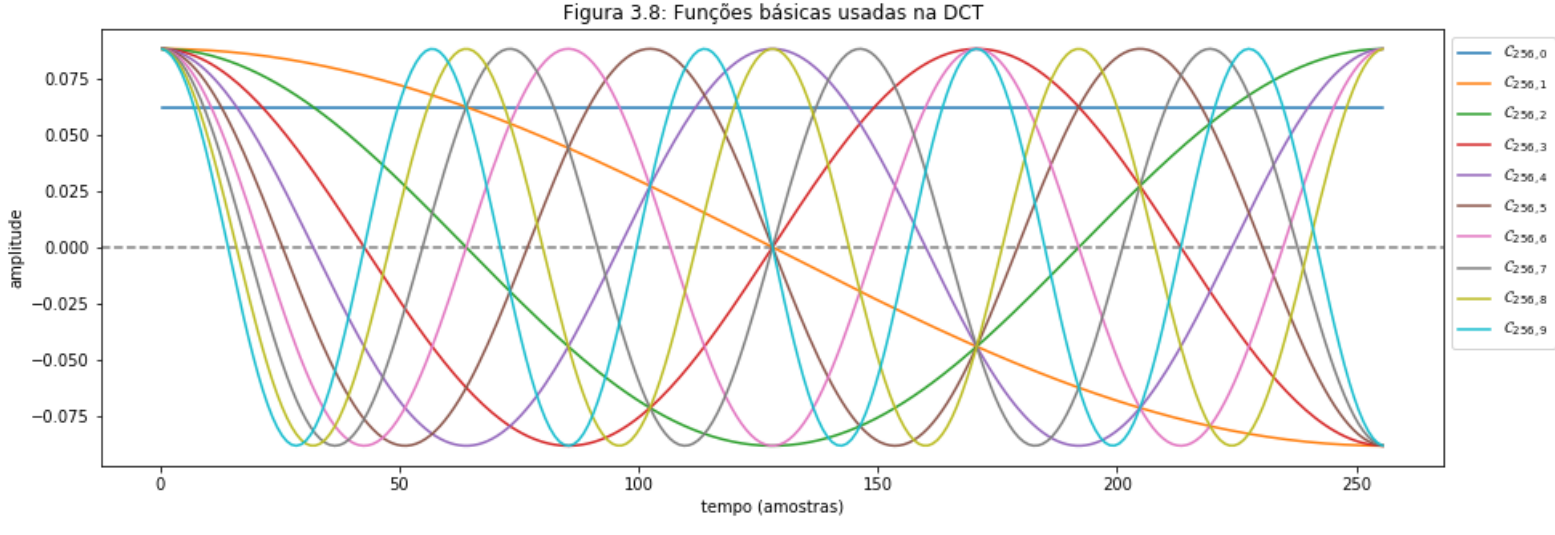
MAC0317/MAC5920

Introdução ao Processamento de Sinais Digitais

Seção 3.5: Propriedades da DCT

Seção 3.5.2: Domínio da frequência para a DCT

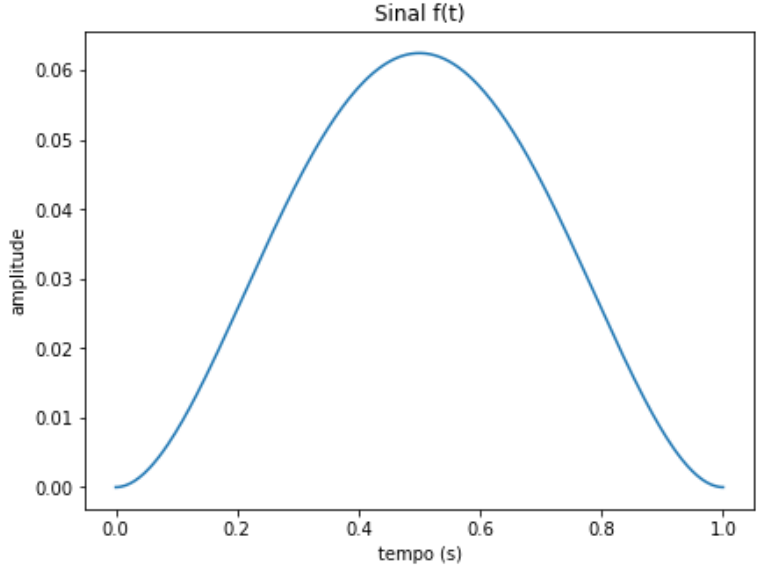
In [19]:
```
N=256; t = np.arange(0.5,N,1); plt.figure(figsize=(15,5))
plt.title(r'Funções básicas da DCT $\mathcal{C}_{256,k}$ $0\leq k < 9$')
plt.xlabel('tempo (amostras)'); plt.ylabel('amplitude')
plt.axhline(y=0.0, color='gray', linestyle='--', ms=1)
for k in range(10):
    plt.plot(t, m.sqrt((1+(k>0))/N)*np.cos(m.pi*k*t/N), label=r"$\mathcal{C}_{256, %d}$" % k)
plt.title("Figura 3.8: Funções básicas usadas na DCT")
plt.legend(loc='upper left', bbox_to_anchor=(1, 1))
plt.show()
```

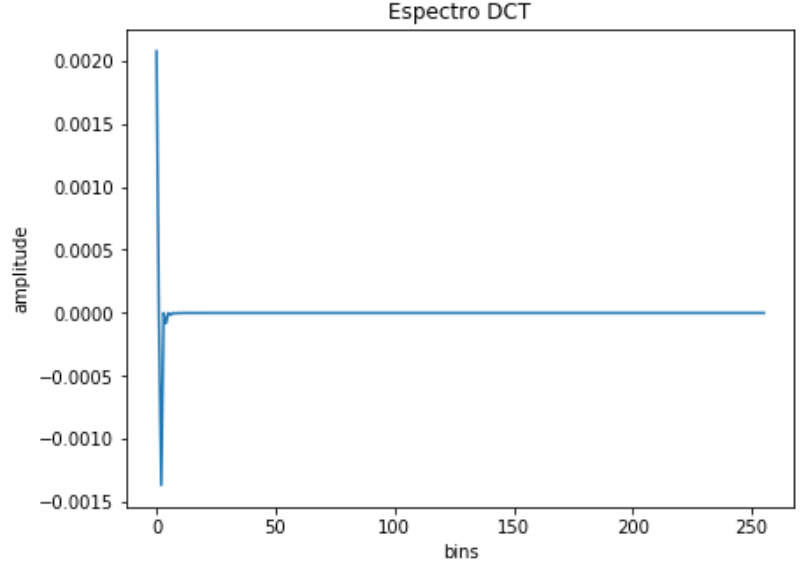


Seção 3.5.3 - Repetição dos exemplos anteriores usando DCT ao invés de DFT

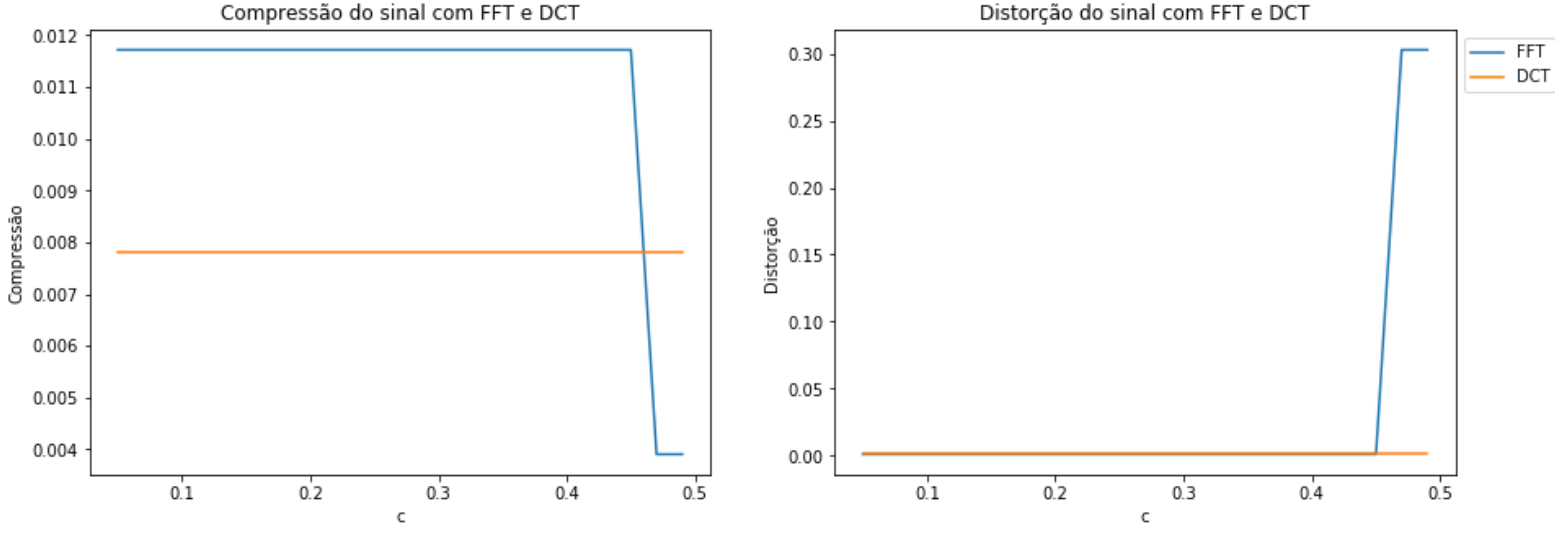
Exemplo 1: Função $f(t) = (t - t^2)^2$

In [21]:
```
t = np.linspace(0, 1, 256)
f = (t - t**2) **2
X = plot_func_dct(t,f)
```



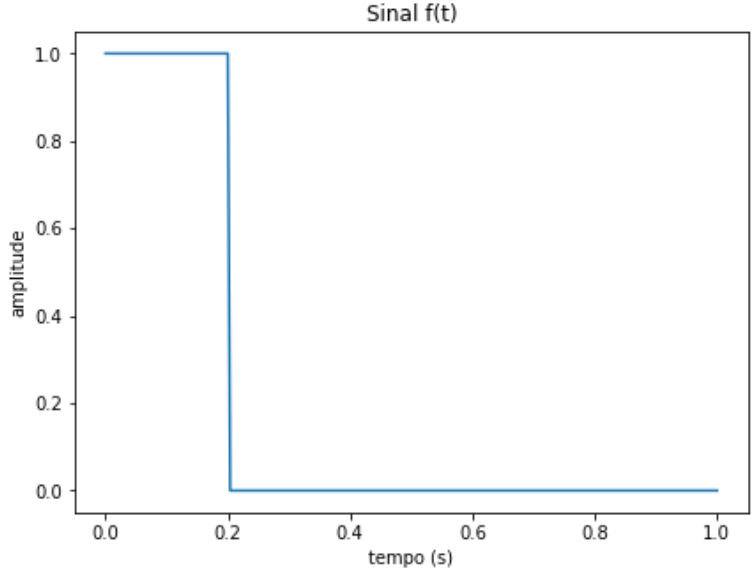


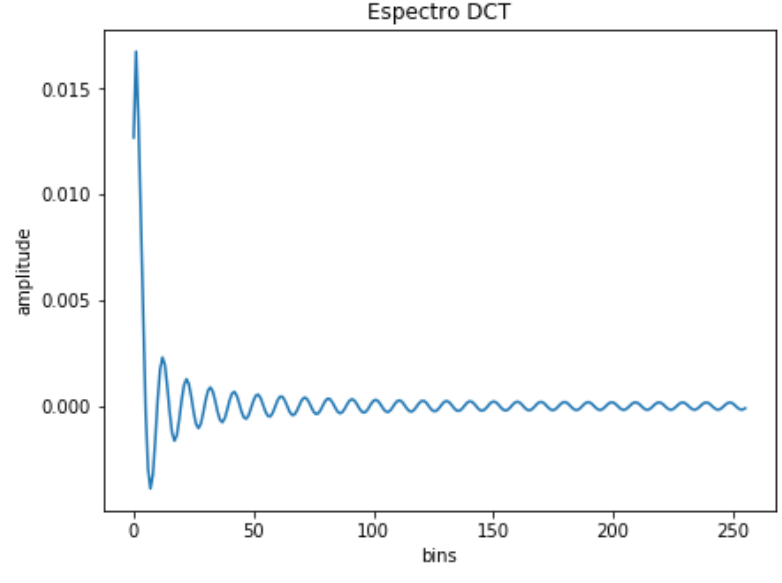
In [23]:
```
plot_threshold(f, c_max=0.5)
```



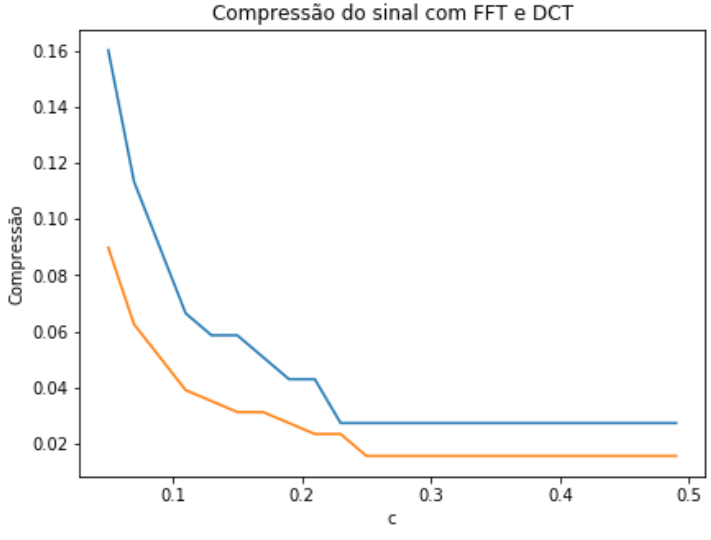
Exemplo 2: Função degrau

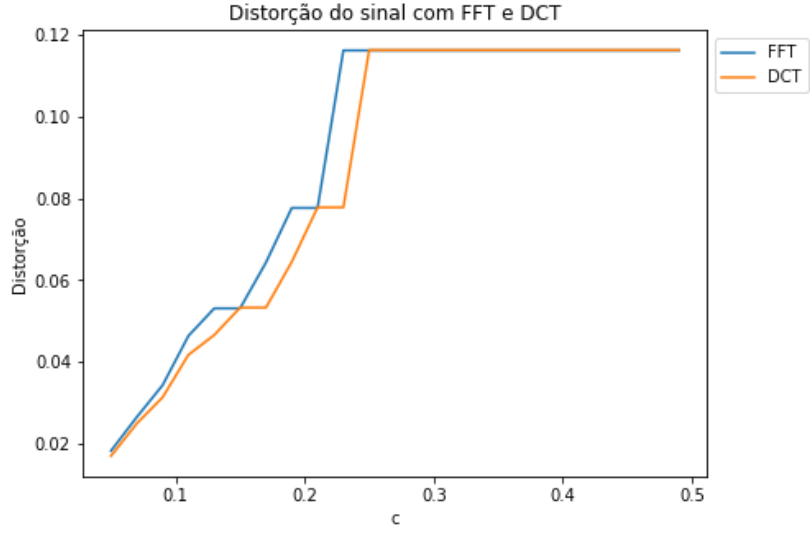
In [24]:
```
N = 256
t = np.linspace(0, 1, N);
f = np.zeros(N)
f[0 : int(np.floor(0.2 * N+1))] += 1
plot_func_dct(t,f)
```





In [25]:
```
plot_threshold(f, c_max=0.5)
```





Reconstrução da função degrau usando DCT (iterativo)

In [27]:
```
# Cria o ambiente interativo
w = interactive(plt_sampled_signal, c=c,)
display(VBox([w.children[1], w.children[0]], layout=Layout(align_items='center'
)))
w.update()
```

Exemplo 3: Função $f(t) = t$

In [28]:
```
N=256;
t = np.linspace(0,1,N);
f = t;
plot_func_dct(t,f)
```

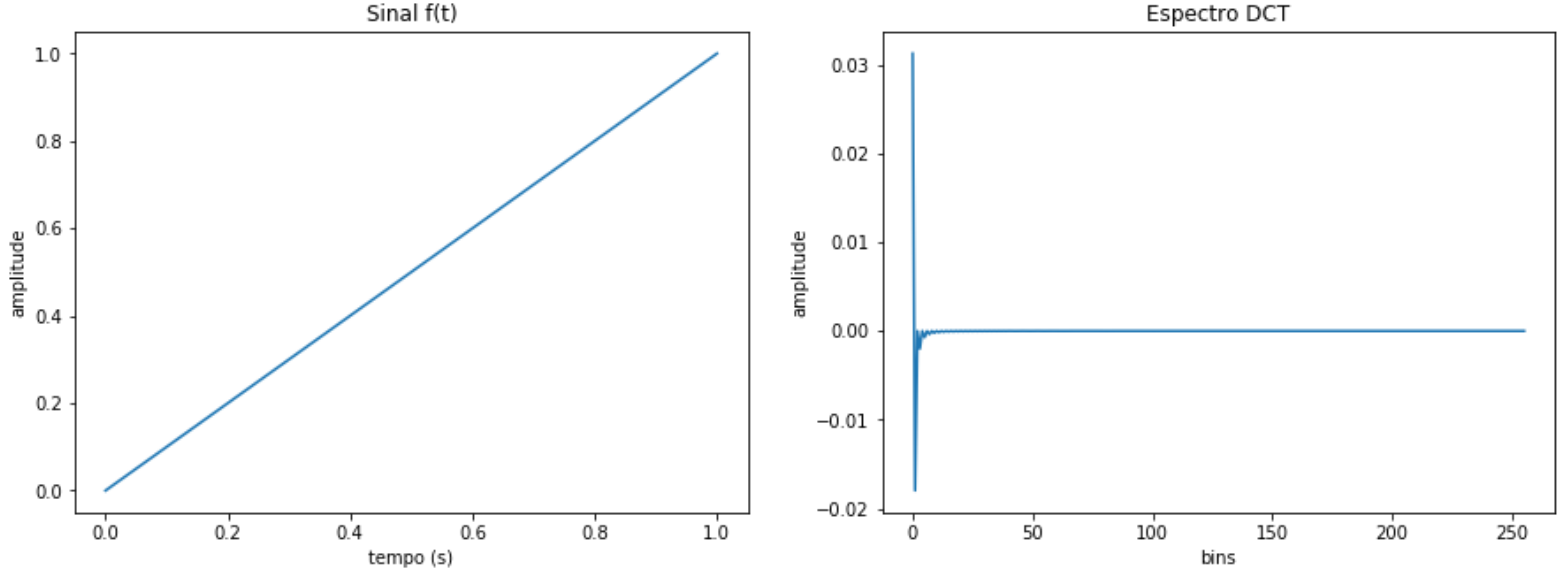
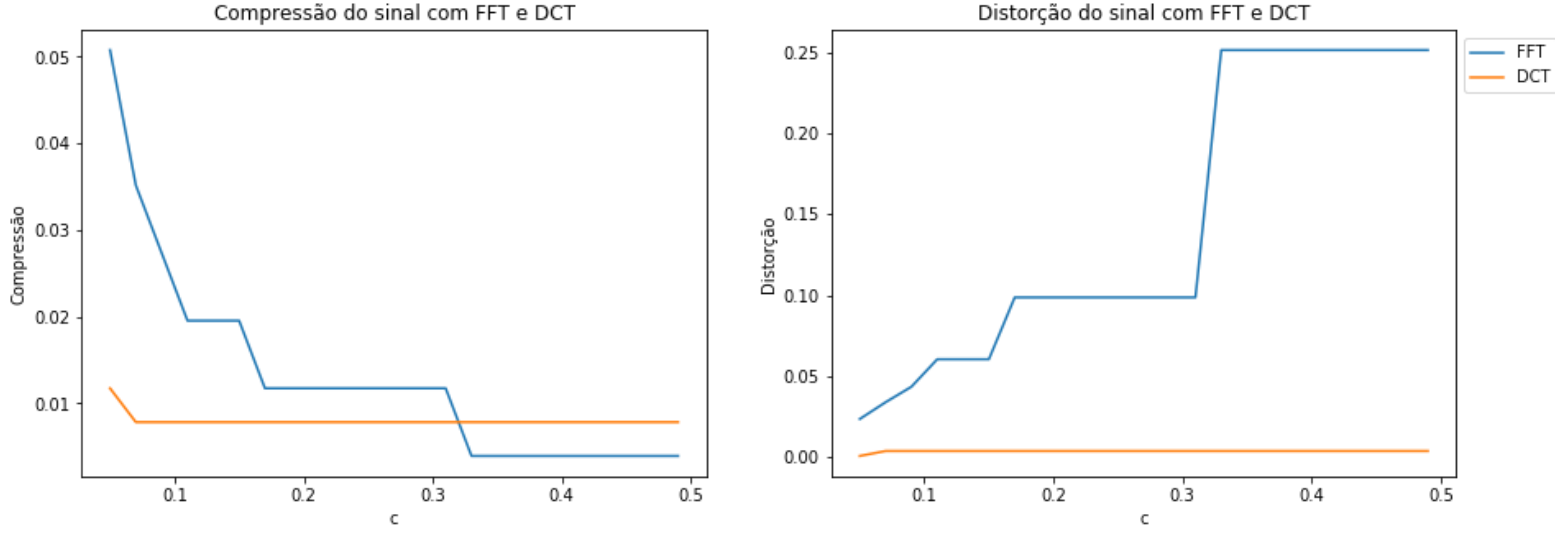


Gráfico correspondente à Tabela 3.6 para $f(t) = t$

In [29]:
```
plot_threshold(f)
```



Reconstrução da função $f(t) = t$ usando DCT (iterativo)

In [31]:
```
# Cria o ambiente interativo
w = interactive(plt_sampled_signal, c=c,)
display(VBox([w.children[1], w.children[0]], layout=Layout(align_items='center'
)))
w.update()
```

In [33]:

```
X = np.fft.fft(f)
C1 = np.linspace(1e-8,10 ** -0.3, 50)
P, D = comp_dist_list(f,C1,method='fft')
PC, DC = comp_dist_list(f,C1,method='dct')
plt.figure(figsize=(15,5));plt.plot(P, D, label='FFT');plt.plot(PC, DC, label=
'DCT')
plt.title("$D(c)$ versus $P(c)$ na compressao de $f(t)=t$ usando FFT e DCT");plt
.xlabel("P(c)");plt.ylabel("D(c)");plt.xlim([0,0.5])
plt.legend(loc='upper left', bbox_to_anchor=(1, 1));plt.show()
```