18.085 Computational Science and Engineering	May 6,2010

Solutions to Problem Set 11

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[4.3-7]
$c = (0, \frac{1}{2}, 0, \frac{1}{2})^T$.

[4.3-9]
1) $(4, 0, 0, 0, 4, 0, 0, 0)^T$

2) $(4, 0, 0, 0, -4, 0, 0, 0)^T$

[4.3-20]

- F: $\frac{n}{2} log_2 n$
- F^{-1}: $\frac{n}{2} log_2 n$
- E: n

[4.4-1]
$t = 10$

[4.4-4]
FFt way is faster.

[4.4-6]
$\delta_N = (1, 0, 0, \ldots, 0)$

[4.4-7]
$s = (\ldots, 0, 1, 0, \ldots)$ (1 is in the d_1's position).

$s_N = (0, 1, 0, \ldots, 0)$.

[4.5-3]

- $\frac{1}{2\pi}$
- $\frac{1}{\pi(1+x^2)}$

[4.5-4]

- π

- $\frac{\pi}{2a^3}$

[4.5-7]

- $-ik\pi^{1/2}e^{-k^2/2}$
- $(2\pi)^{1/2}(1-k^2)e^{-k^2/2}$

[4.5-11]
$\hat{u} = \frac{e^{-ikd}}{a+ik}$
For u, note that the fourier transform of

$$f(x) = \begin{cases} e^{-ax} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

is $\frac{1}{a+ik}$. So we have

$$u(x) = f(x-d) = \begin{cases} e^{-a(x-d)} & x \geq d \\ 0 & x < d \end{cases}$$