

A decorative background pattern consisting of a complex network of blue lines and dots, resembling a circuit board or a neural network, with some dots highlighted in a light blue glow.

Transformation de Laplace inverse

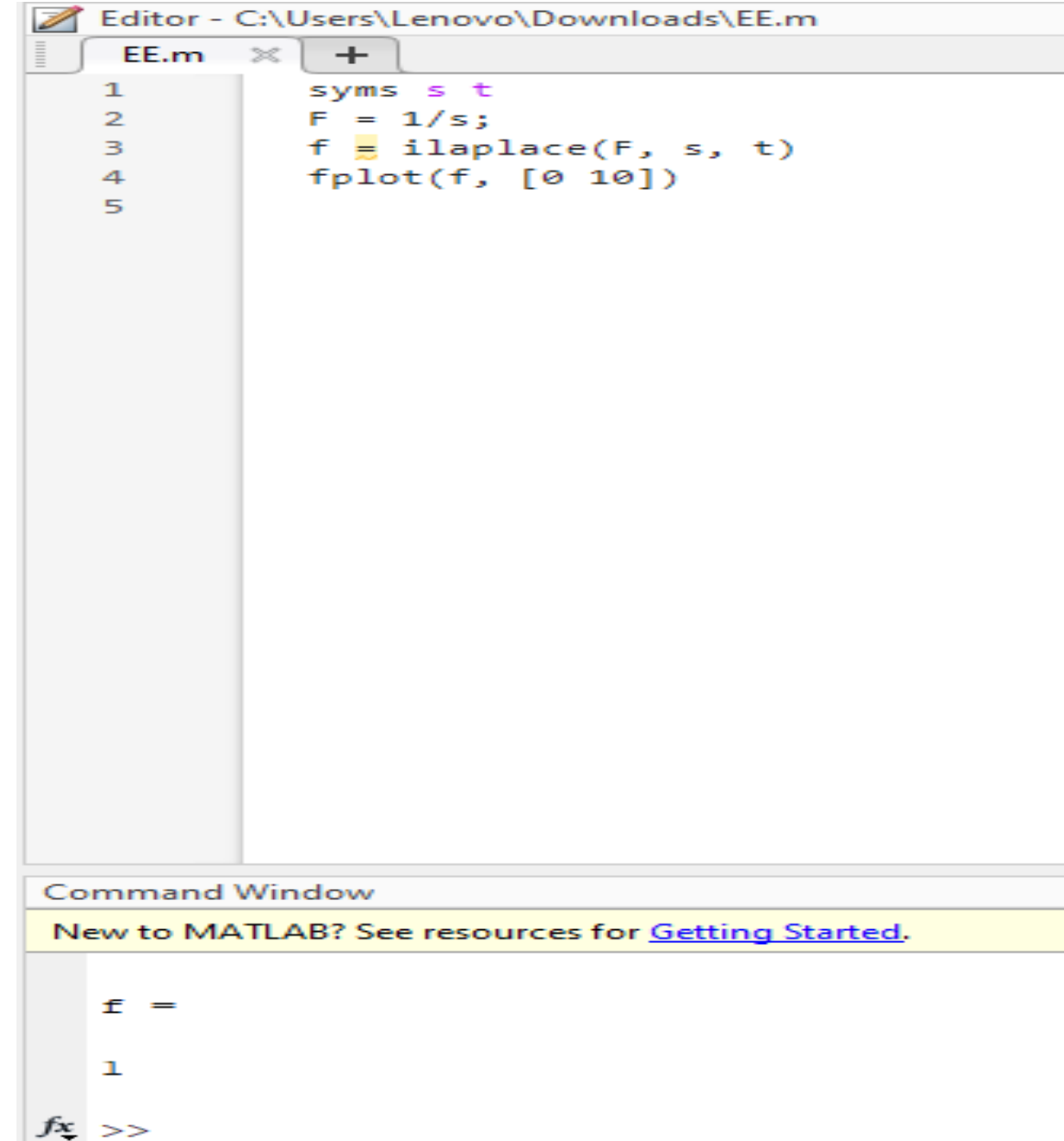
Transformée de Laplace inverse du signal échelon $u(t)$:

$$u(t) = \begin{cases} 0 & \text{si } t < 0 \\ 1 & \text{si } t \geq 0 \end{cases}$$

$$\mathcal{L}\{u(t)\} = \frac{1}{s} \quad \text{Pour: } s > 0$$

⇓
⇓
⇓
⇓ \mathcal{L}^{-1}

$$\mathcal{L}^{-1}\left\{\frac{1}{s}\right\} = u(t)$$



The image shows a MATLAB Editor window titled 'Editor - C:\Users\Lenovo\Downloads\EE.m' with a single tab 'EE.m'. The code in the editor is as follows:

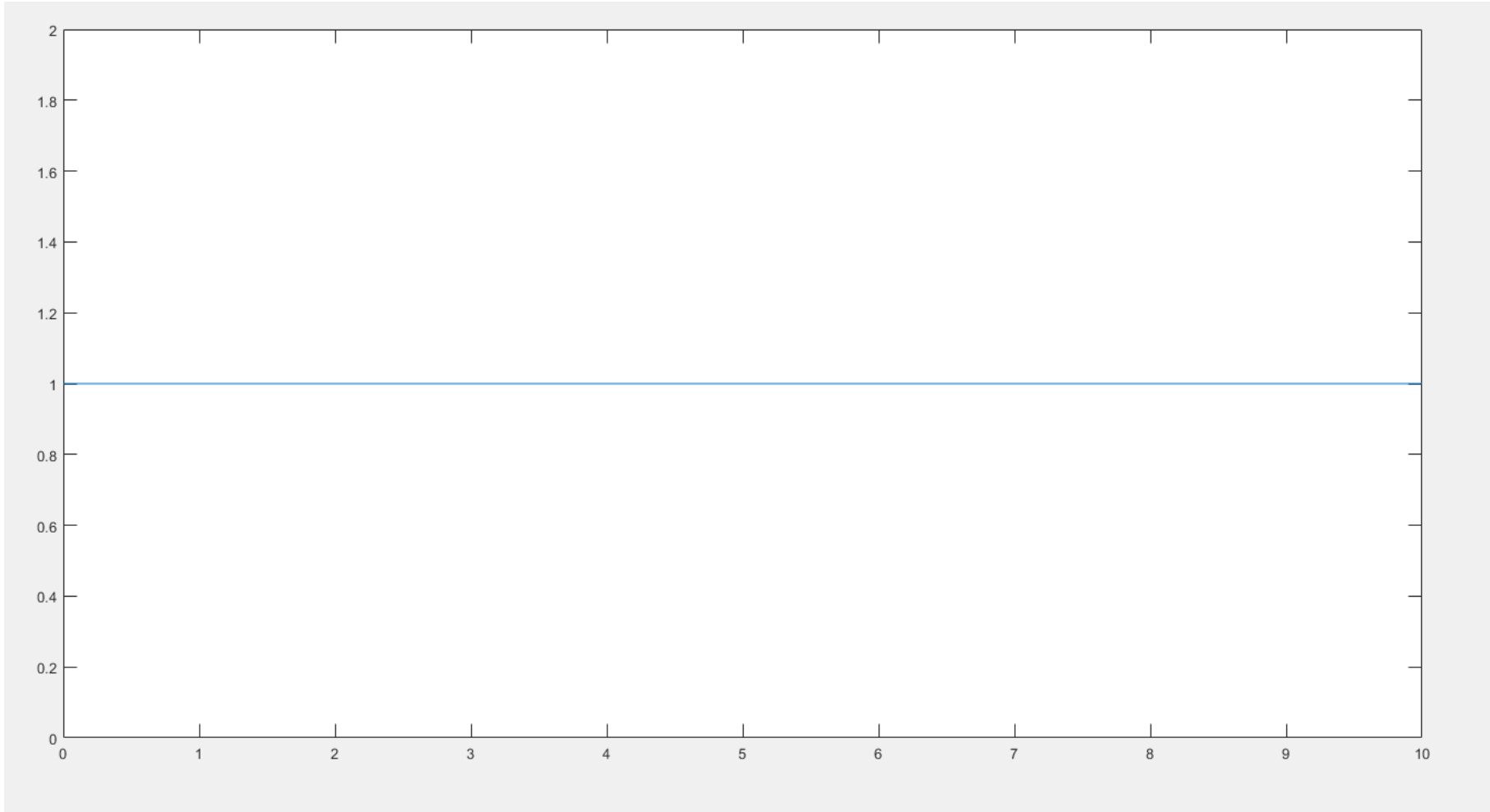
```
1 syms s t
2 F = 1/s;
3 f = ilaplace(F, s, t)
4 fplot(f, [0 10])
5
```

Below the editor is the 'Command Window' with the message: 'New to MATLAB? See resources for [Getting Started.](#)'

The output in the Command Window is:

```
f =
1
fx >>
```

Graphe Transformée de Laplace inverse du signal échelon $u(t)$



Transformée de Laplace inverse du signal exponentiel

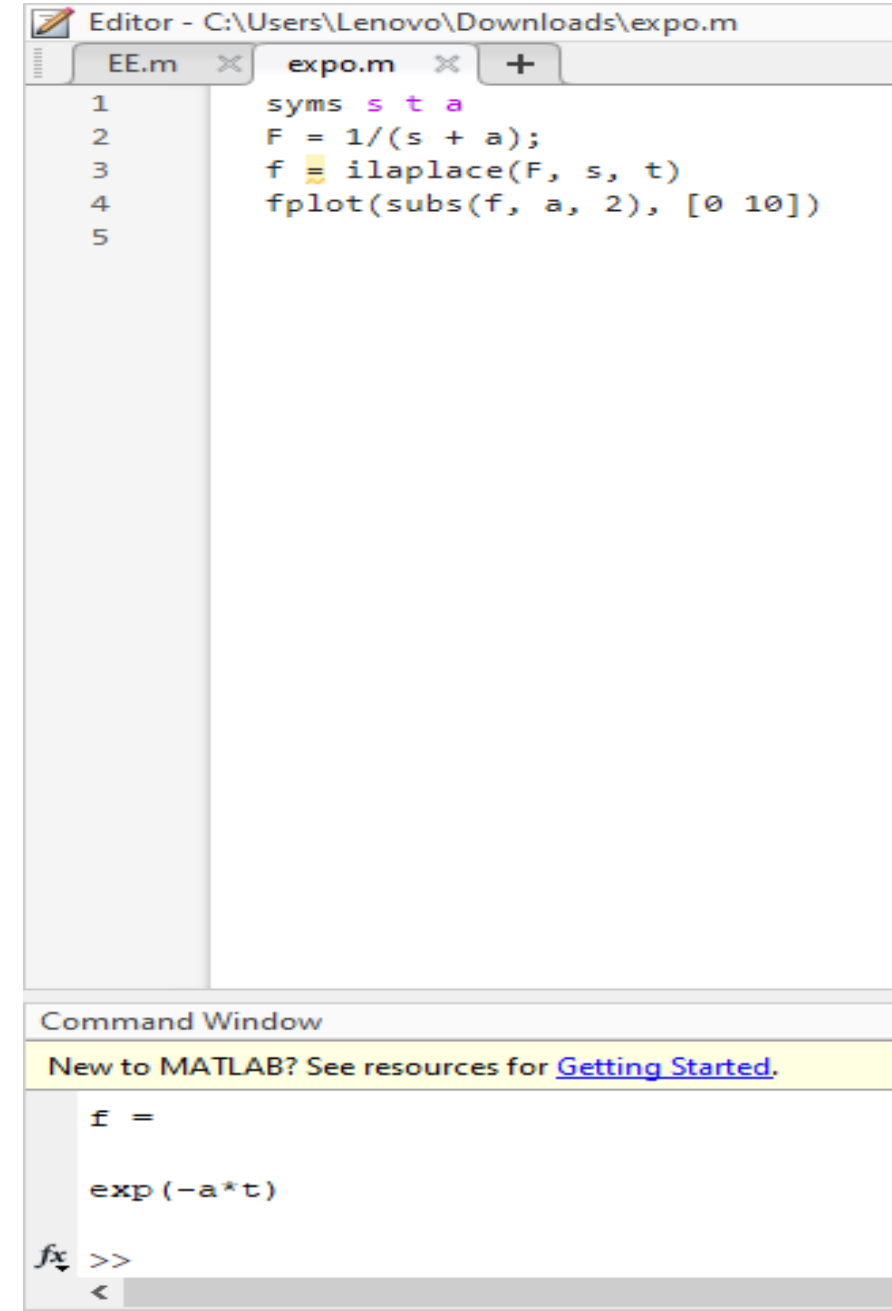
$$x(t) = e^{at} \cdot u(t)$$

$$\mathcal{L}\{e^{at} \cdot u(t)\} = \frac{1}{s - a} \quad \text{Pour : } s > a$$



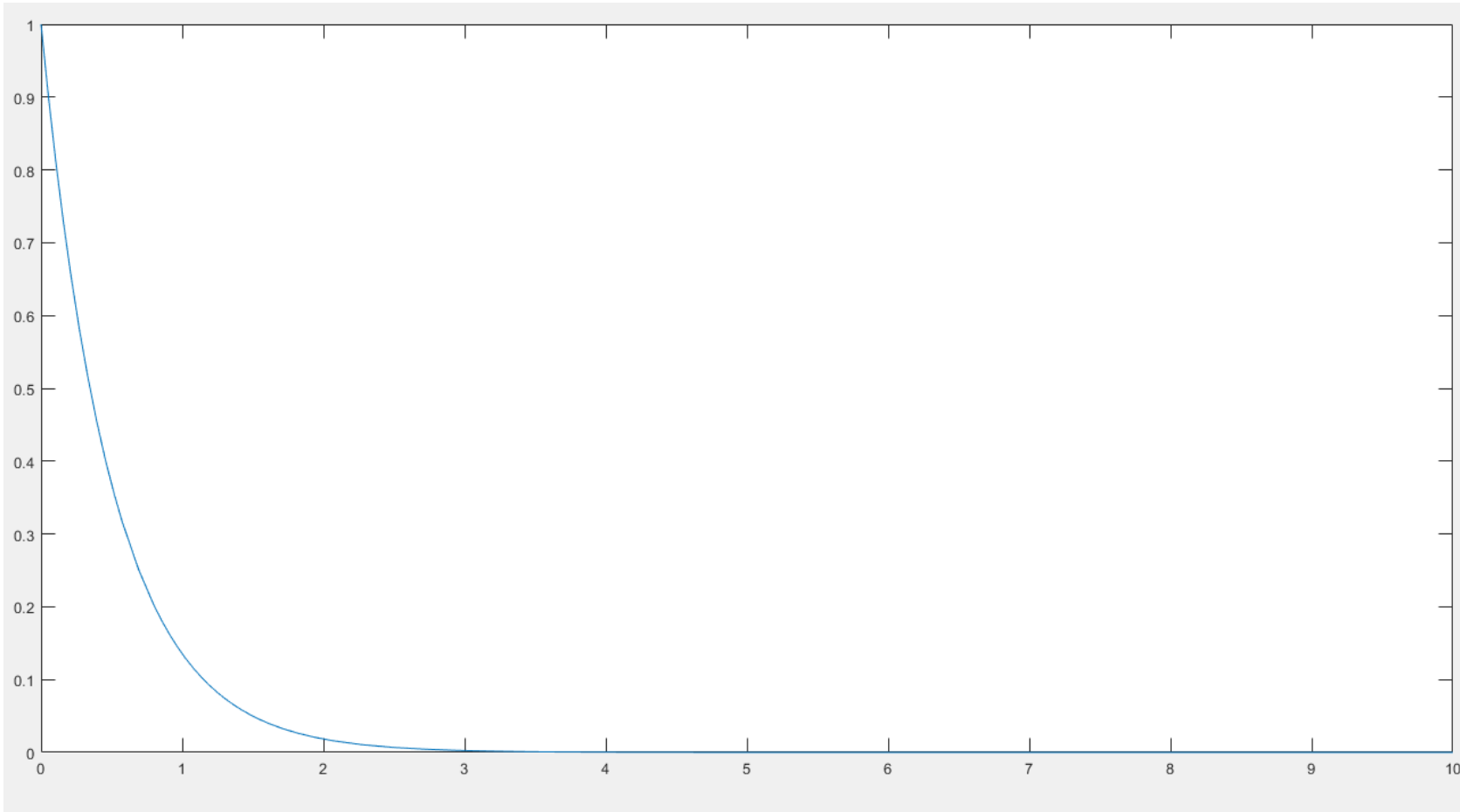
$$\mathcal{L}^{-1} \left\{ \frac{1}{s - a} \right\} = e^{at} \cdot u(t)$$

a : est le **taux de croissance ou de décroissance** de l'exponentielle dans le signal.



```
Editor - C:\Users\Lenovo\Downloads\expo.m
EE.m  expo.m  +
1      syms s t a
2      F = 1/(s + a);
3      f = ilaplace(F, s, t)
4      fplot(subs(f, a, 2), [0 10])
5
Command Window
New to MATLAB? See resources for Getting Started.
f =
exp(-a*t)
fx >>
<
```

Grphe Transformée de Laplace inverse du signal exponentiel

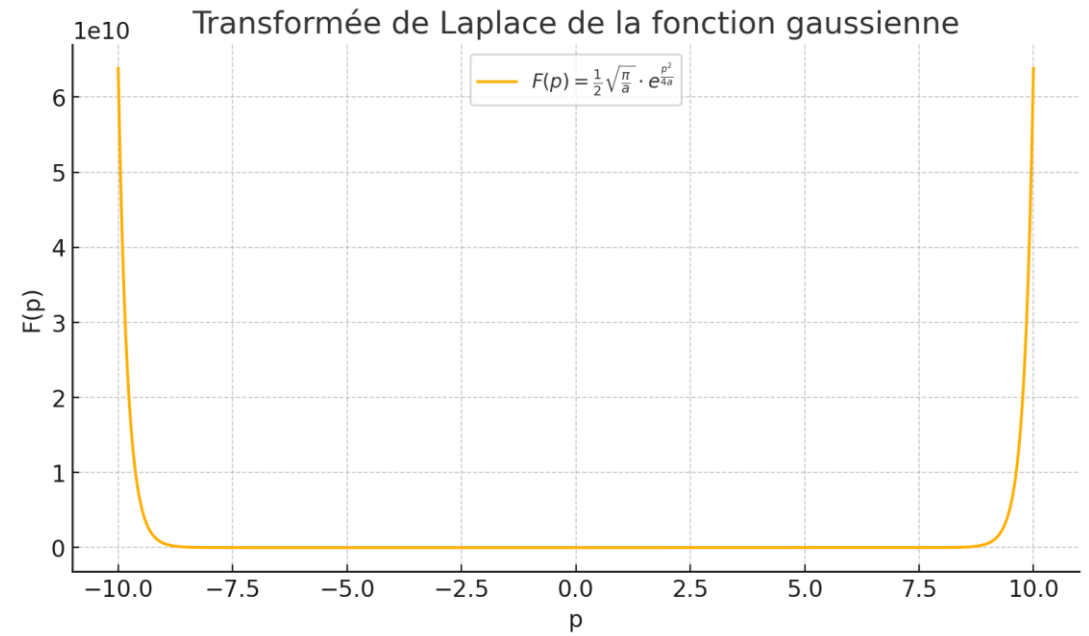


Transformée de Laplace inverse du signal Gaussiennes

$$F(S) = \frac{1}{2} \sqrt{\frac{\pi}{a}} \cdot e^{\frac{s^2}{4a}}$$

a : facteur de contrôle de la largeur de la courbe. , Pour $a > 0$

$$TL^{-1}(F(S)) = e^{-at^2}$$



avec $a = 1$

Code MATLAB Transformée de Laplace inverse du signal Gaussiennes

```
+9
1  clc;
2  clear;
3  close all; % Fermer toutes les figures précédentes
4
5  syms s t a real
6
7  % Définition de la fonction F(s)
8  F = (1/2)*sqrt(pi/a) * exp(s^2 / (4*a));
9
10 % Valeur numérique pour a
11 a_val = 1;
12
13 % Substitution de la valeur de a dans F(s)
14 F_sub = subs(F, a, a_val);
15
16 % Calcul de la transformée de Laplace inverse
17 f_t = ilaplace(F_sub, s, t);
18
19 % Simplification du résultat
20 f_t = simplify(f_t);
21
22 % Vérification manuelle avec la forme connue
23 f_t_correct = exp(-a_val*t^2); % Forme théorique attendue
24
25 % Création de la fonction numérique
26 f_numeric = matlabFunction(f_t_correct, 'Vars', t);
27
28 % Génération des valeurs de t
29 t_vals = linspace(-2, 2, 1000); % Intervalle ajusté
30
31 % Évaluation de f(t)
32 f_vals = f_numeric(t_vals);
33
34 % Tracé
```

```
Editor - C:\Users\Lenovo\Downloads\untitled72.m
+9
30
31 % Évaluation de f(t)
32 f_vals = f_numeric(t_vals);
33
34 % Tracé
35 figure;
36 plot(t_vals, f_vals, 'b', 'LineWidth', 2);
37 title('Transformée de Laplace Inverse de F(s) = (1/2)\surd(\pi/a) e^{\{s^2/4a\}}');
38 xlabel('Temps t');
39 ylabel('f(t)');
40 grid on;
41 legend('f(t) = e^{-at^2}');
42 set(gca, 'FontSize', 12); % Meilleure lisibilité
43
44 % Affichage des résultats symboliques
45 disp('Résultat symbolique de la transformée inverse:');
46 disp(f_t);
47 disp('Résultat théorique attendu:');
48 disp(f_t_correct);
```

Command Window

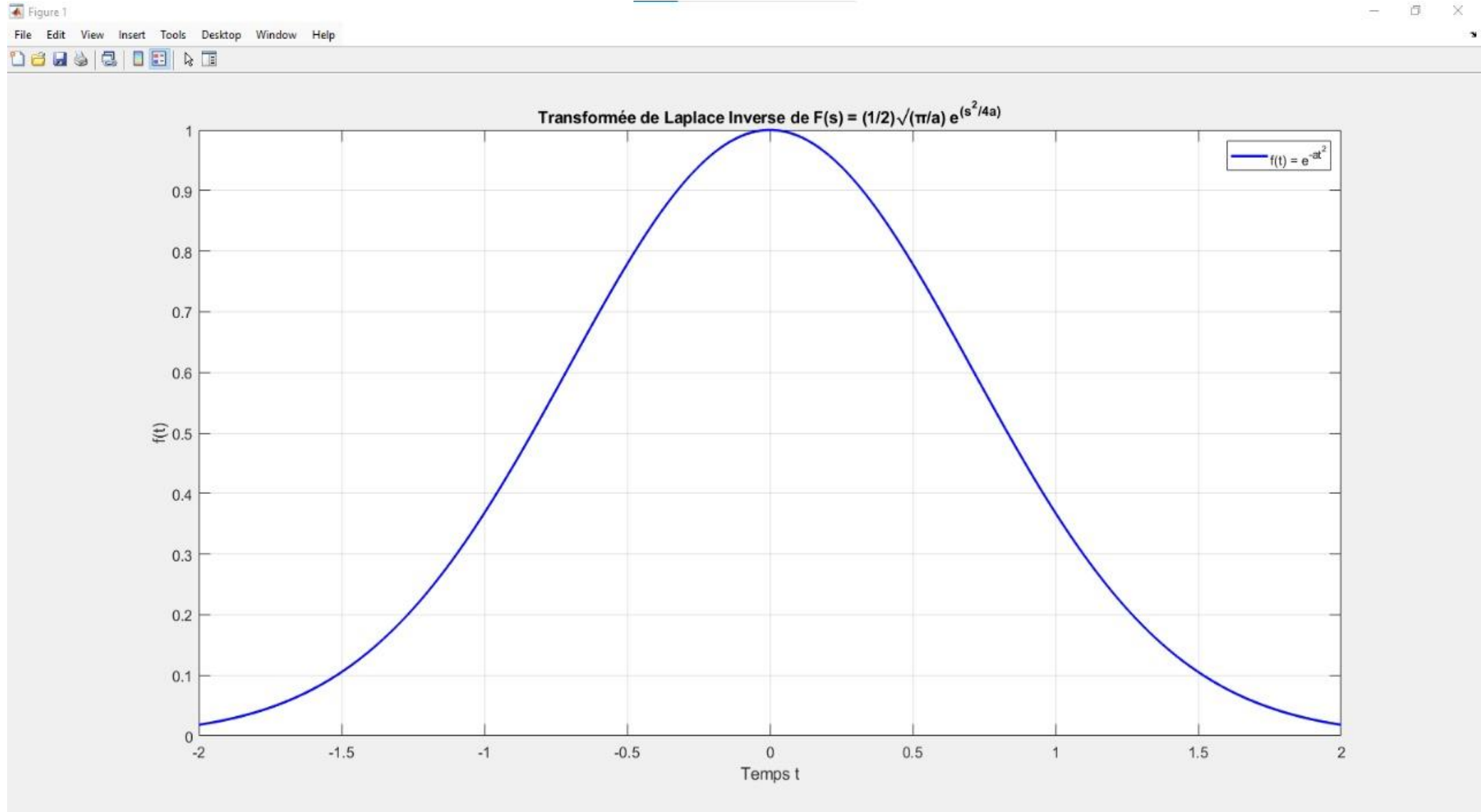
New to MATLAB? See resources for [Getting Started](#).

```
Résultat théorique attendu:
exp(-t^2)
```

 >>

Command Window

Graphe Transformée de Laplace inverse du signal Gaussiennes



Transformée de Laplace inverse du signal peigne de Dirac

$$F(s) = \frac{1}{1 - e^{-Ts}}$$

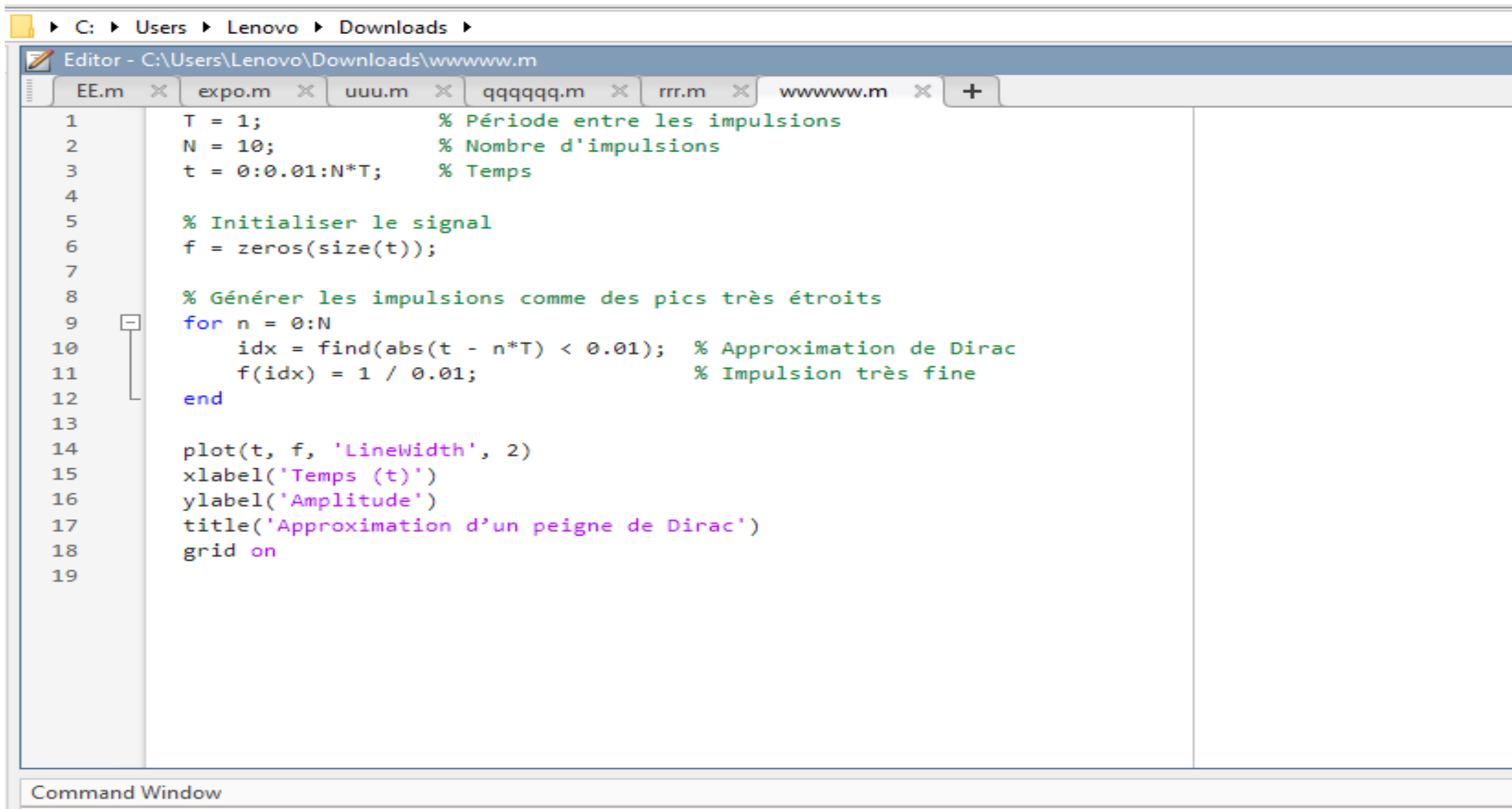
$$\checkmark \quad TL(\delta(t - a)) = e^{-as}$$



$$TL^{-1}(e^{-as}) = \delta(t - at)$$

$$TL^{-1} \left(\frac{1}{1 - e^{-Ts}} \right) = \sum_{n=0}^{\infty} \delta(t - nT)$$

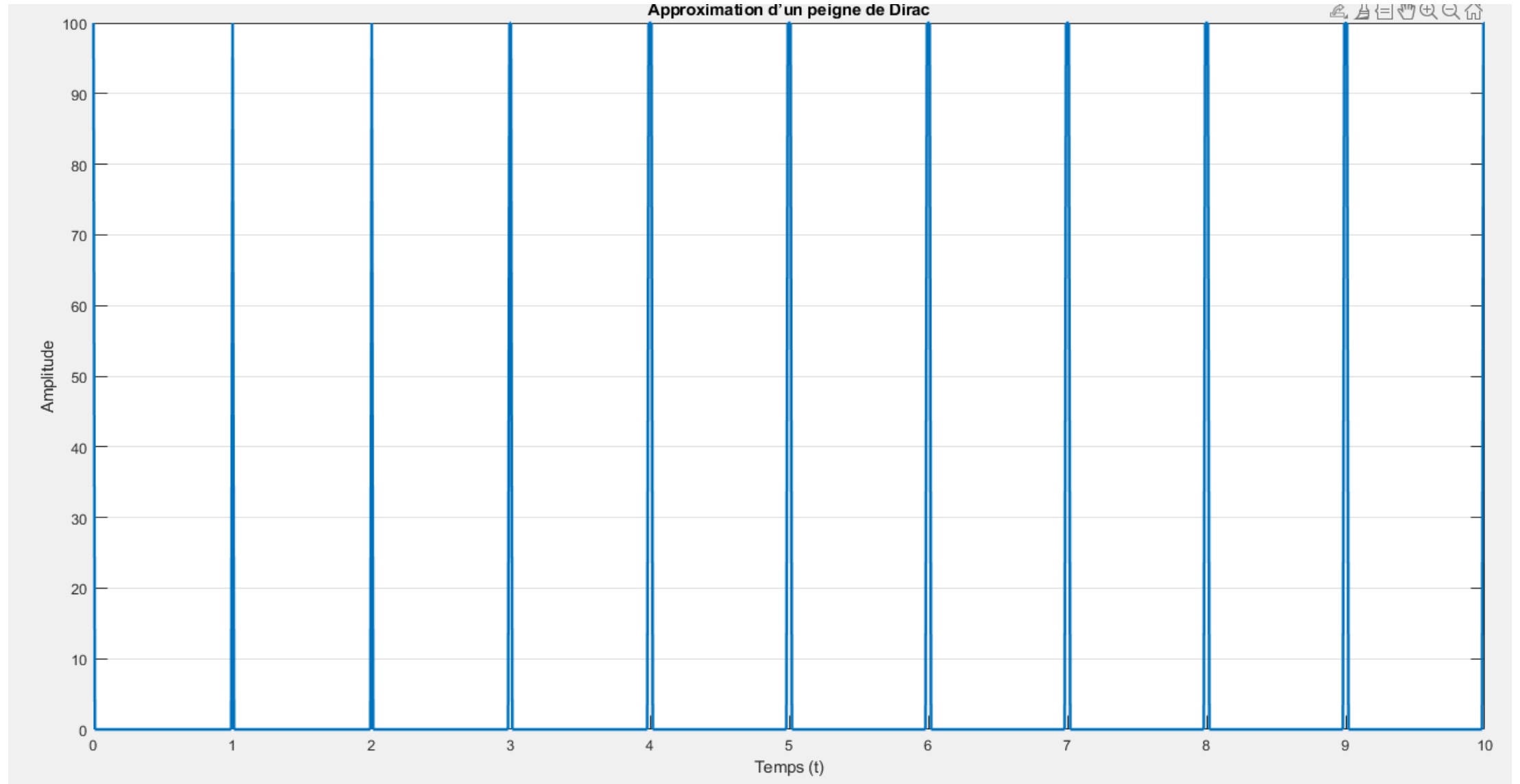
Code MATLAB Transformée de Laplace inverse du peigne de Dirac



The image shows a MATLAB Editor window with a script for approximating a Dirac comb signal. The script is saved as 'wwwwww.m' in the 'Downloads' folder. The code defines parameters for the period (T), number of impulses (N), and time vector (t). It initializes a signal vector 'f' and then uses a for loop to generate impulses as narrow peaks. The plot is titled 'Approximation d'un peigne de Dirac' and includes axis labels and a grid.

```
C:\Users\Lenovo\Downloads\
Editor - C:\Users\Lenovo\Downloads\wwwwww.m
EE.m x expo.m x uuu.m x qqqqqq.m x rrr.m x wwwwww.m x +
1      T = 1;           % Période entre les impulsions
2      N = 10;          % Nombre d'impulsions
3      t = 0:0.01:N*T;  % Temps
4
5      % Initialiser le signal
6      f = zeros(size(t));
7
8      % Générer les impulsions comme des pics très étroits
9      for n = 0:N
10         idx = find(abs(t - n*T) < 0.01); % Approximation de Dirac
11         f(idx) = 1 / 0.01;               % Impulsion très fine
12     end
13
14     plot(t, f, 'LineWidth', 2)
15     xlabel('Temps (t)')
16     ylabel('Amplitude')
17     title('Approximation d'un peigne de Dirac')
18     grid on
19
Command Window
```

Grappe Transformée de Laplace inverse du peigne de Dirac



Transformée de Laplace inverse du signal portes

$$F(s) = \frac{1 - e^{-ST}}{s} = \frac{1}{s} - \frac{e^{-ST}}{s}$$

$$\checkmark \quad TL^{-1} \left(\frac{1}{s} \right) = u(t)$$

$$\checkmark \quad TL^{-1} \left(\frac{e^{-ST}}{s} \right) = u(t - T)$$

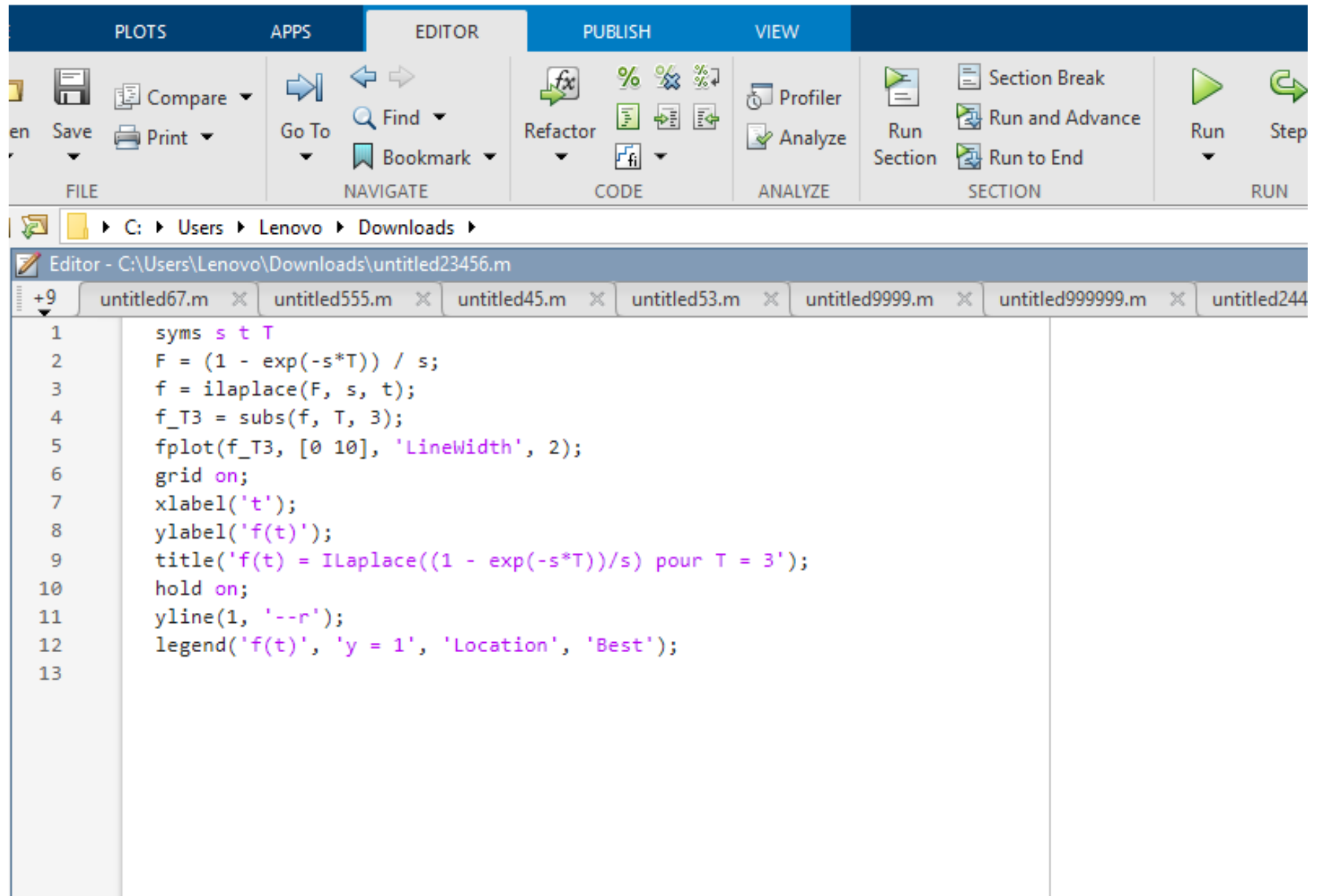


$$F(t) = u(t) - u(t - T)$$

signal portes

$$\Pi(t) = \begin{cases} 1 & \text{si } 0 \leq t \leq T \\ 0 & \text{sinon} \end{cases}$$

Code MATLAB Transformée de Laplace inverse du signal portes

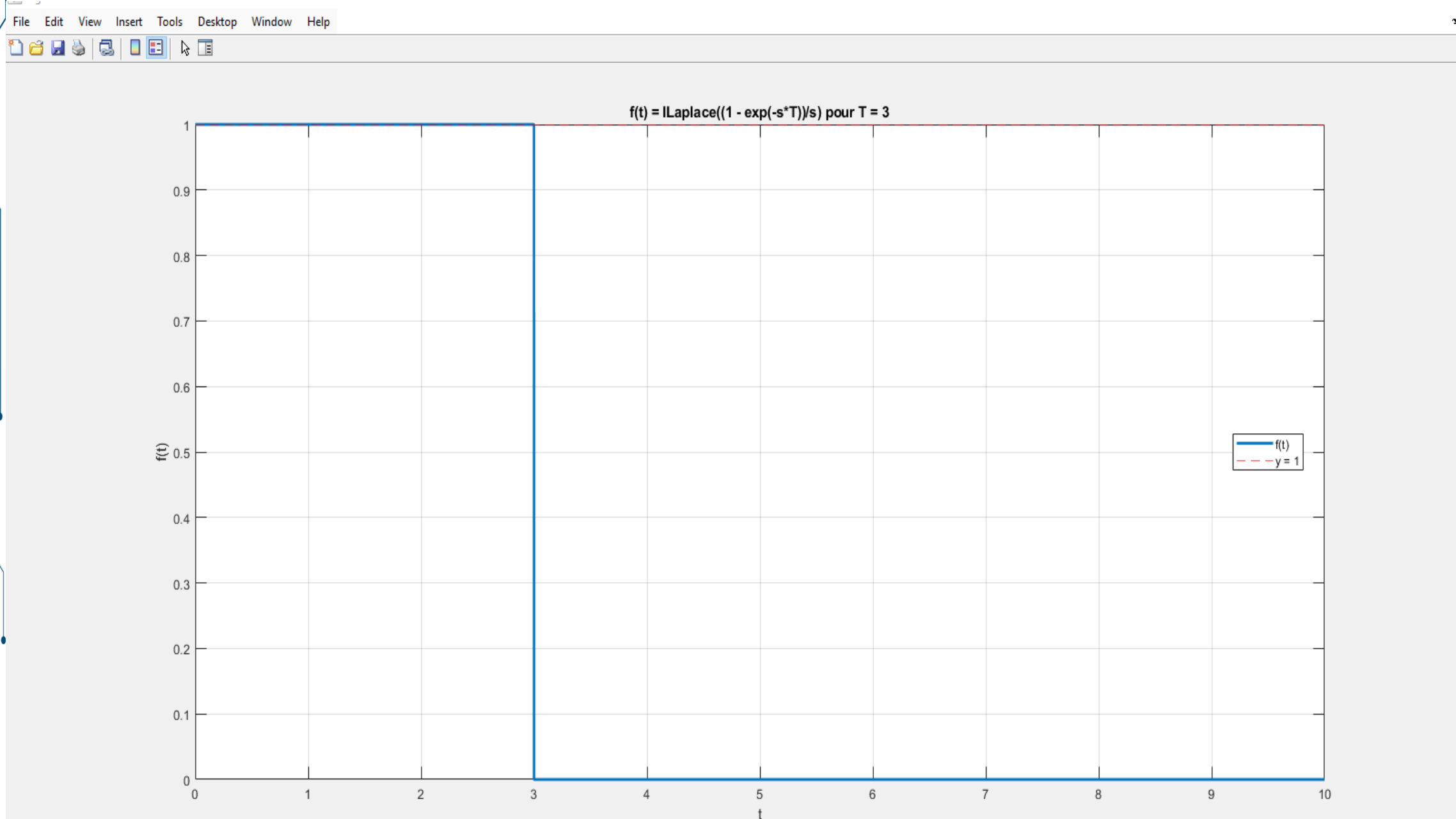


The image shows the MATLAB Editor interface. The top toolbar includes tabs for PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The EDITOR tab is active, showing a menu with options like Save, Print, Go To, Find, and Bookmark. The PUBLISH tab shows options like Refactor, Run, and Run to End. The VIEW tab shows options like Profiler and Analyze. The bottom toolbar shows Run and Step buttons.

The current file is `untitled23456.m`, located at `C:\Users\Lenovo\Downloads`. The script content is as follows:

```
1 syms s t T
2 F = (1 - exp(-s*T)) / s;
3 f = ilaplace(F, s, t);
4 f_T3 = subs(f, T, 3);
5 fplot(f_T3, [0 10], 'LineWidth', 2);
6 grid on;
7 xlabel('t');
8 ylabel('f(t)');
9 title('f(t) = Ilaplace((1 - exp(-s*T))/s) pour T = 3');
10 hold on;
11 yline(1, '--r');
12 legend('f(t)', 'y = 1', 'Location', 'Best');
13
```

Graphe Transformée de Laplace inverse du signal portes



Transformée de Laplace inverse du signal triangulaire

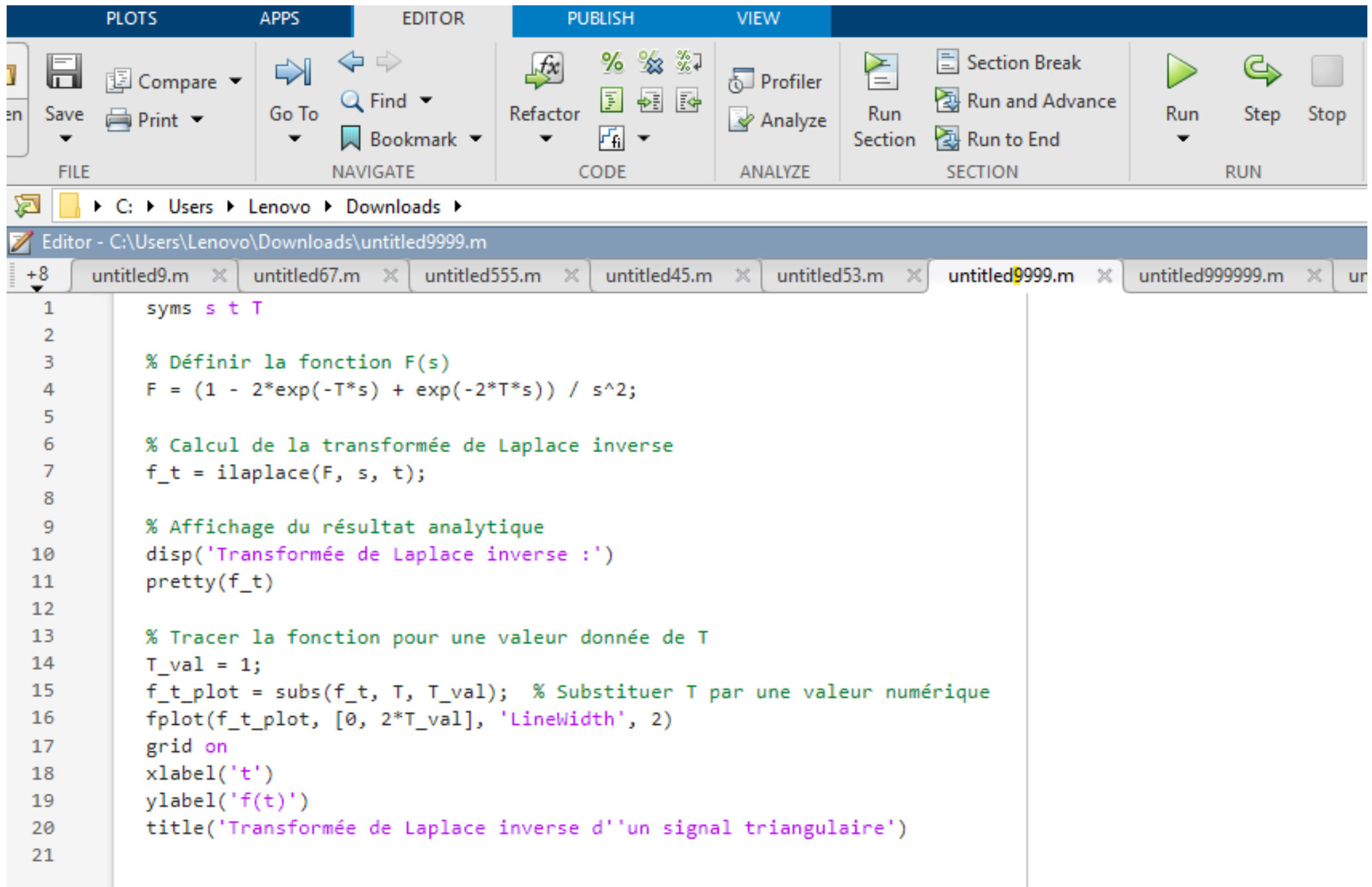
$$F(s) = \frac{1 - 2e^{-Ts} + e^{-2Ts}}{s^2} = \frac{1}{s^2} - \frac{2e^{-Ts}}{s^2} + \frac{e^{-2Ts}}{s^2}$$

Terme	Transformé de Laplace
$r(t)=tu(t)$	$\frac{1}{s^2}$
$r(t-T)=(t-T)u(t-T)$	$\frac{e^{-Ts}}{s^2}$
$r(t-2T)=(t-2T)u(t-2T)$	$\frac{e^{-2Ts}}{s^2}$

$$F(t)=tu(t)-2(t-T)u(t-T)+(t-2T)u(t-2T)$$

signal triangulaire

Code MATLAB Transformée de Laplace inverse du signal triangulaire



The image shows the MATLAB IDE interface. The top menu bar includes PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The toolbar contains various icons for file operations (Save, Print, Compare), navigation (Go To, Find, Bookmark), code editing (Refactor), analysis (Profiler, Analyze), and execution (Run, Step, Stop). The current file is 'untitled9999.m' located in 'C:\Users\Lenovo\Downloads'. The script content is as follows:

```
1 syms s t T
2
3 % Définir la fonction F(s)
4 F = (1 - 2*exp(-T*s) + exp(-2*T*s)) / s^2;
5
6 % Calcul de la transformée de Laplace inverse
7 f_t = ilaplace(F, s, t);
8
9 % Affichage du résultat analytique
10 disp('Transformée de Laplace inverse :')
11 pretty(f_t)
12
13 % Tracer la fonction pour une valeur donnée de T
14 T_val = 1;
15 f_t_plot = subs(f_t, T, T_val); % Substituer T par une valeur numérique
16 fplot(f_t_plot, [0, 2*T_val], 'LineWidth', 2)
17 grid on
18 xlabel('t')
19 ylabel('f(t)')
20 title('Transformée de Laplace inverse d'un signal triangulaire')
21
```


Graphe Transformée de Laplace inverse du signal triangulaire

