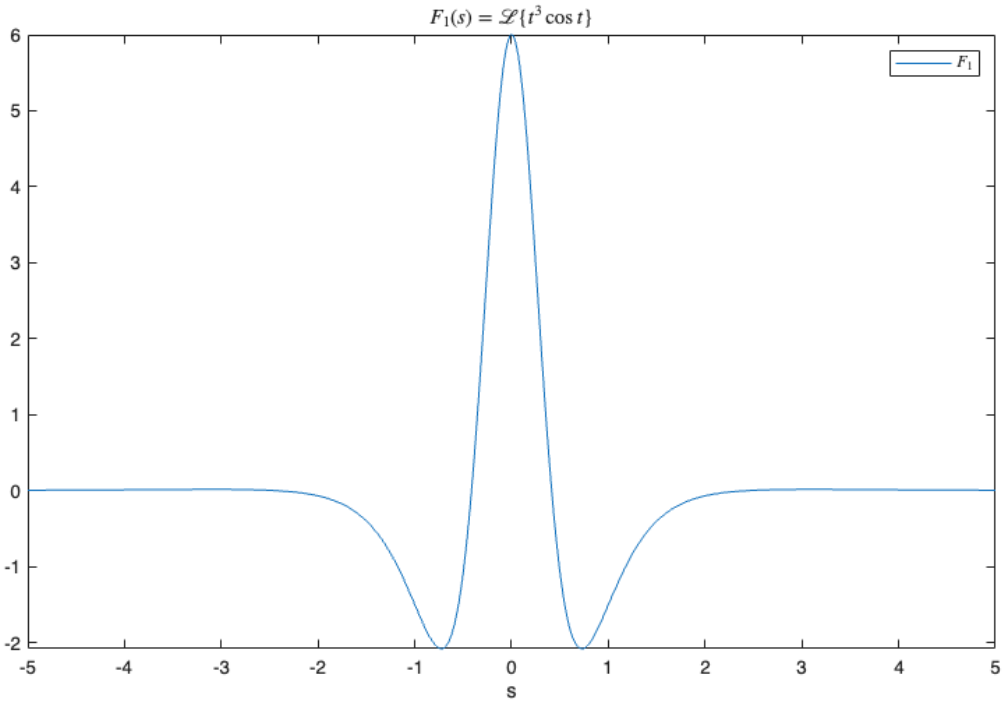
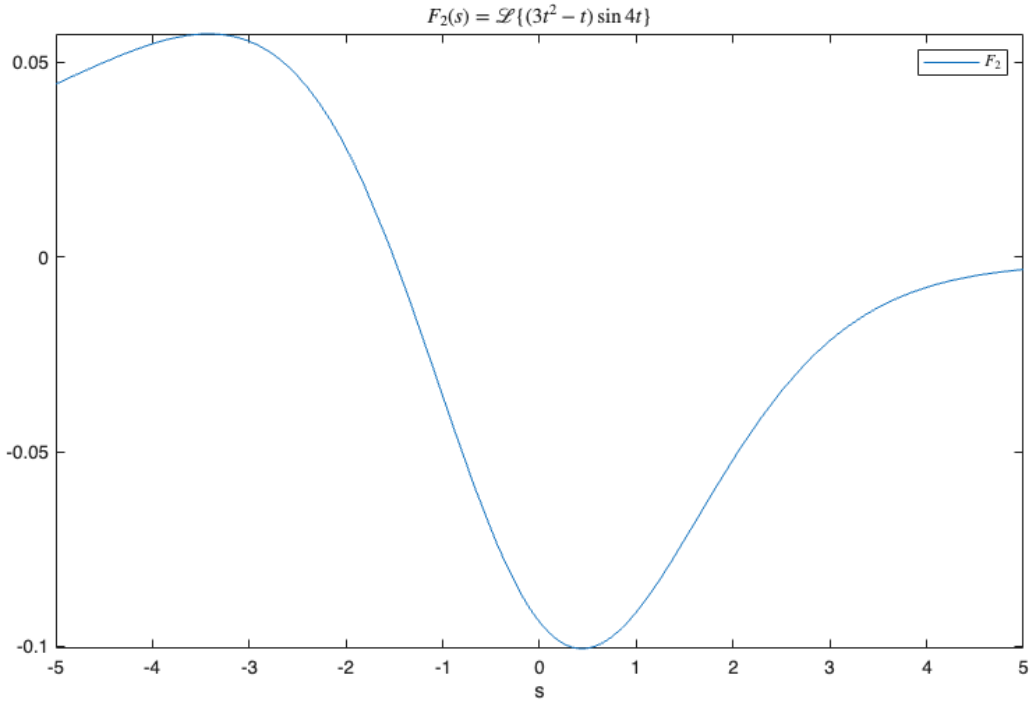
```
%==========Solution to Sim04Q1==========%

clc % clear command window
clear all % remove all variables from workspace
close all % close all figures

%----------Q1a----------%

% intro symbolic variable t
syms t;

% define symbolic expression f = t^3cos(t)
f1 = t.^3.*cos(t)

% calculate laplace transform as a symbolic expression
F1 = laplace(f1)

% plot the laplace transform
figure;
fplot(F1)
xlabel('s') % label horizontal axis as s
legend('$F_1$','Interpreter','latex') % label graph
title('$F_1(s) = \mathcal{L}\{t^3\cos t\}$','Interpreter','latex') % create
title using LaTeX for pretty math

%----------Q1b----------%

% define symbolic expression f = (3t^2-t)sin(4t)
f2 = (3.*t.^2-t).*sin(4.*t)

% calculate laplace transform as a symbolic expression
F2 = laplace(f2)

% plot the laplace transform
figure;
fplot(F2)
xlabel('s') % label horizontal axis as s
legend('$F_2$','Interpreter','latex') % label graph
title('$F_2(s) = \mathcal{L}\{(3t^2-t)\sin 4t\}$','Interpreter','latex') %
create title using LaTeX for pretty math


f1 =

t^3*cos(t)


F1 =

6/(s^2 + 1)^2 - (48*s^2)/(s^2 + 1)^3 + (48*s^4)/(s^2 + 1)^4


f2 =
```

```
-sin(4*t)*(- 3*t^2 + t)
```

```
F2 =
```

```
-(8*s^3 - 72*s^2 + 128*s + 384)/(s^6 + 48*s^4 + 768*s^2 + 4096)
```





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```
%==========Solution to Sim04Q2==========%

clc % clear command window
clear all % remove all variables from workspace
close all % close all figures

% Note.
% The laplaceNum function is defined in a .m file in the same path
% and is the same as the one from the Simulation04Companion, except that I
% have included semicolons to hide outputs.

% define function handle f(t) = cos(t^2)
f = @(t) cos(t.^2);

% numerically calculate the laplace transform
F = laplaceNum(f);

%----------Q1a----------%

% evaluate F at 2+i
F(2+i)

%----------Q1b----------%

% evaluate F at 2+i
F(2-i)
```

```
ans =

   0.3842 - 0.1168i


ans =

   0.3842 + 0.1168i
```

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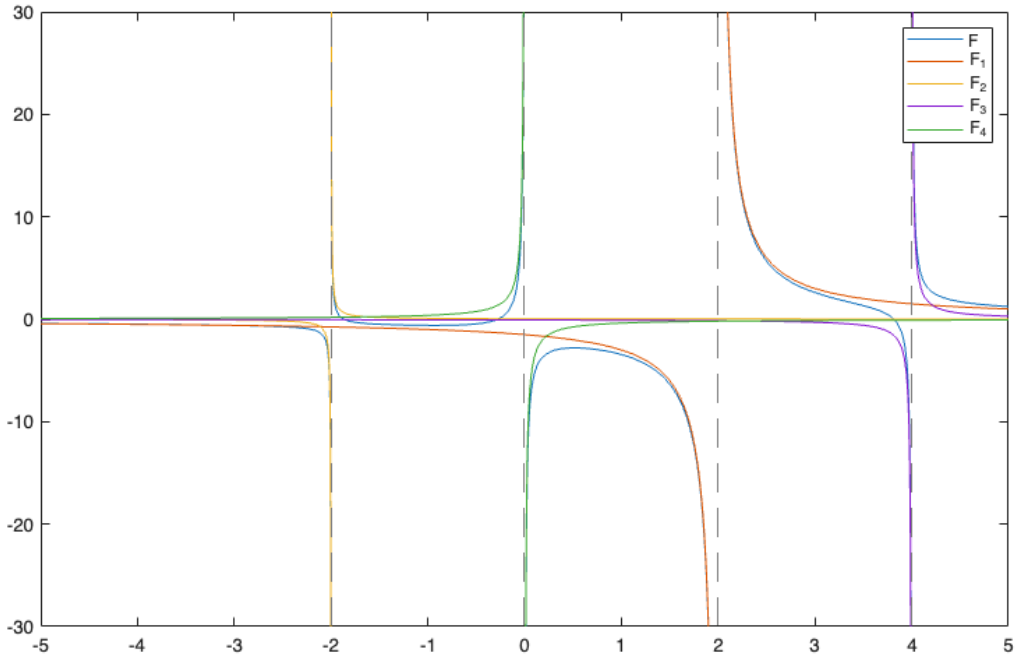
```
%==========Solution to Sim04Q3==========%

clc % clear command window
clear all % remove all variables from workspace
close all % close all figures

% intro symbolic variable t
syms s;

% define symbolic expression F = 3/(s-2)+(s+3)/(s^3-2s^2-8s)
F = 3./(s-2)+(s+3)./(s.^3-2.*s.^2-8.*s);

% calculate the partial fraction decomposition of F
F = partfrac(F);

% prettily display the partial fraction decomposition
pretty(F)

% plot F and the parts of its partial fraction decomposition
figure % new figure
fplot(F) % plot F
hold on
fplot(children(F,1)) % plot F_1
hold on
fplot(children(F,2)) % plot F_2
hold on
fplot(children(F,3)) % plot F_3
hold on
fplot(children(F,4)) % plot F_4
legend("F","F_1","F_2","F_3","F_4") % label F, F_1, F_2, F_3, F_4
```

```
  3          1            7         3
----- + ---------- + ---------- - ---
s - 2   12 (s + 2)   24 (s - 4)   8 s
```



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