

# ECE 3510 homework # 3

a

1. Find the inverse Laplace transform of each of the following functions:

Use the mixed method and the tables.

a)  $F(s) = \frac{2 \cdot s}{s^2 + 2 \cdot s + \frac{5}{4}}$

b)  $F(s) = \frac{8 \cdot s + 4}{s^2 \cdot (s + 1)^2}$

c)  $F(s) = \frac{\frac{1}{2} \cdot s^3 + s^2 + s + \frac{5}{2}}{s^2 \cdot (s^2 + 2 \cdot s + 5)}$

2.  $F(s) = \frac{s - 1}{s^3 \cdot (s^2 + 2 \cdot s + 5)^2}$  Show the form of  $f(t)$  without actually finding it. Indicate which of the coefficients may not be 0

3. Problem 2.3a - f in textbook (p.20)

As part of your work to reach a solution, draw the pole diagram for each.

**Answers** (time functions below valid for  $t \geq 0$  only)

1. a)  $2 \cdot e^{-t} \cdot \cos\left(\frac{1}{2} \cdot t\right) - 4 \cdot e^{-t} \cdot \sin\left(\frac{1}{2} \cdot t\right)$       b)  $4 \cdot t - 4 \cdot t \cdot e^{-t}$       c)  $\frac{1}{2} \cdot t + \frac{1}{2} \cdot e^{-t} \cdot \cos(2 \cdot t)$

2.  $A + B \cdot t + C \cdot t^2 + \sqrt{E^2 + F^2} \cdot e^{at} \cdot \cos(b \cdot t + \theta) + \sqrt{G^2 + H^2} \cdot t \cdot e^{at} \cdot \cos(b \cdot t + \phi)$

Can't be 0:  $C$  &  $\sqrt{G^2 + H^2}$

Alternate solution:

$A + B \cdot t + C \cdot t^2 + E \cdot e^{at} \cdot \cos(b \cdot t) + F \cdot e^{at} \cdot \sin(b \cdot t) + G \cdot t \cdot e^{at} \cdot \cos(b \cdot t) + H \cdot t \cdot e^{at} \cdot \sin(b \cdot t)$

$C$  may not be 0 & Either  $G$  or  $H$  may be 0, but not both

3.	<u>Bounded</u>	<u>Converges</u>	<u><math>f(\infty)</math></u>
a)	yes	yes	0
b)	yes	yes	$-\frac{1}{2}$
c)	no		
d)	yes	yes	5
e)	yes	no	
f)	no		