ECE 3510 homework # 3a

c

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

   Use partial fraction expansion and the tables.

   a) $F(s) = \dfrac{1}{s^2 + 5\cdot s + 6}$ b) $F(s) = \dfrac{s - 1}{s\cdot(s + 2)}$

ECE 3510 homework # 3b

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

   Use the mixed method and the tables.

   a) $F(s) = \dfrac{3\cdot s + 6}{\left(s^2 + 1\right)\cdot\left(s^2 + 4\right)}$ b) $F(s) = \dfrac{1}{(s + 2)\cdot(s + 1)^2}$ c) $F(s) = \dfrac{2\cdot s}{s^2 + 2\cdot s + \frac{5}{4}}$

   d) $F(s) = \dfrac{8\cdot s + 4}{s^2\cdot(s + 1)^2}$ e) $F(s) = \dfrac{\frac{1}{2}\cdot s^3 + s^2 + s + \frac{5}{2}}{s^2\cdot\left(s^2 + 2\cdot s + 5\right)}$

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

4. Problem 2.3a - f in textbook (p.33)

   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) $\left(e^{-2\cdot t} - e^{-3\cdot t}\right)\cdot u(t)$ b) $\left(\frac{3}{2}\cdot e^{-2\cdot t} - \frac{1}{2}\right)\cdot u(t)$

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

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

3. $\left(A + B\cdot t + C\cdot t^2 + D\cdot e^{a\cdot t}\cdot\cos(b\cdot t) + E\cdot e^{a\cdot t}\cdot\sin(b\cdot t) + F\cdot t\cdot e^{a\cdot t}\cdot\cos(b\cdot t) + G\cdot t\cdot e^{a\cdot t}\cdot\sin(b\cdot t)\right)\cdot u(t)$

   C may not be 0 & Either F or G may be 0, but **NOT BOTH**

   Alternate solution:

   $$\left(A + B\cdot t + C\cdot t^2 + \sqrt{D^2 + E^2}\cdot e^{a\cdot t}\cdot\cos(b\cdot t + \theta) + \sqrt{F^2 + G^2}\cdot t\cdot e^{a\cdot t}\cdot\cos(b\cdot t + \phi)\right)\cdot u(t)$$

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

4.

	Bounded	Converges	f(∞)
a)	yes	yes	0
b)	yes	yes	$-\frac{1}{2}$
c)	no		
d)	yes	yes	5
e)	yes	no	
f)	no		