Name: _____ ECE 3510 homework 3B Due: Tue, 1/23/24 d

1. 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) $F(s) = \dfrac{2 \cdot s}{s^2 + 2 \cdot s + \dfrac{5}{4}}$

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

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

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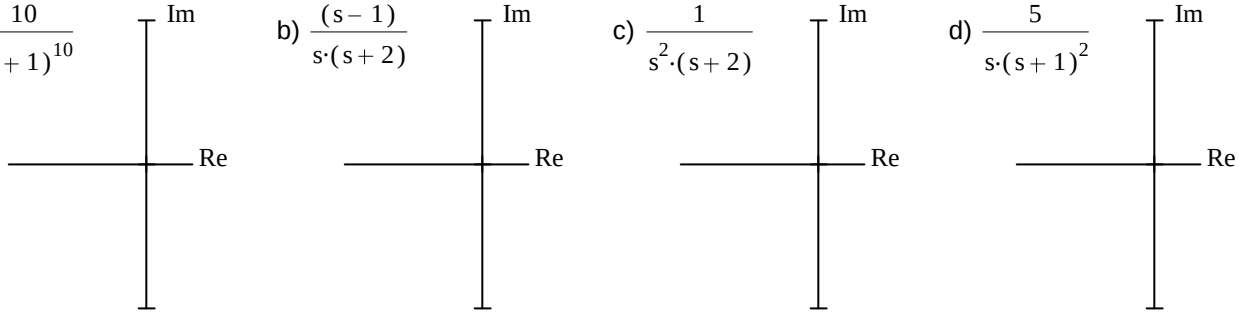
2. $F(s) = \dfrac{s-1}{s^3\cdot\left(s^2+2\cdot s+5\right)^2}$

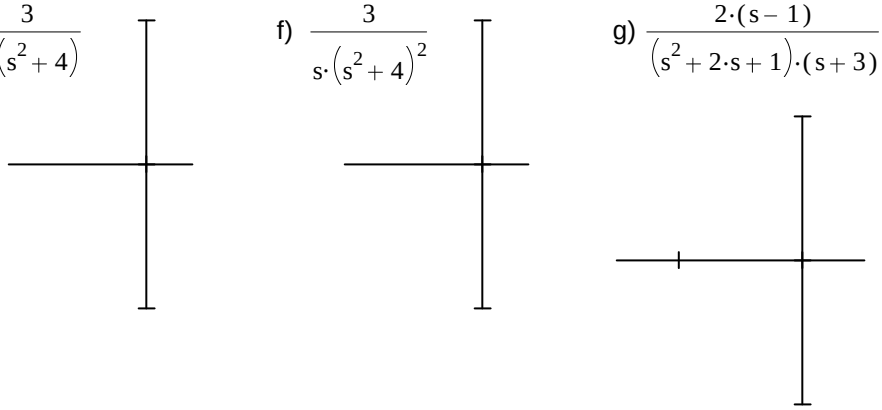
Show the form of f(t) without actually finding it. Indicate which of the coefficients may not be 0

3. Problem 2.3 a) - g) in textbook (p.21) As part of your work to reach a solution, draw the pole diagram for each.

a) $\dfrac{10}{(s+1)^{10}}$ b) $\dfrac{(s-1)}{s\cdot(s+2)}$ c) $\dfrac{1}{s^2\cdot(s+2)}$ d) $\dfrac{5}{s\cdot(s+1)^2}$



e) $\dfrac{3}{s\cdot\left(s^2+4\right)}$ f) $\dfrac{3}{s\cdot\left(s^2+4\right)^2}$ g) $\dfrac{2\cdot(s-1)}{\left(s^2+2\cdot s+1\right)\cdot(s+3)}$



	Bounded	Converges	f(∞)
a)			
b)			
c)			
d)			
e)			
f)			
g)			

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

1. 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) $\left(\frac{1}{2}\cdot t+\frac{1}{2}\cdot e^{-t}\cdot\cos(2\cdot t)\right)\cdot u(t)$

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

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

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

3.

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

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