Exercise A.7

L Answer (a).

We are given the function

$$x_1(t) = e^{jat} + e^{jbt},$$

where a and b are real constants. The right-hand side of this equation can be expressed in terms of the cosine function by pulling out a factor of e^{jct}, where c is the average of a and b (i.e., $c = \frac{1}{2}(a+b)$). We have

$$\begin{aligned} x_1(t) &= e^{jat} + e^{jbt} \\ &= e^{j[(a+b)/2]t}\left(e^{j[(a-b)/2]t} + e^{-j[(a-b)/2]t}\right) \\ &= e^{j[(a+b)/2]t}\left(2\cos\left[\tfrac{1}{2}(a-b)t\right]\right) \\ &= 2e^{j(a+b)t/2}\cos\left[\tfrac{1}{2}(a-b)t\right]. \end{aligned}$$

factor out $e^{j(a+b)/2}$

$e^{j\theta} + e^{-j\theta} = 2\cos\theta$

move 2 out front

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