

Foundations of Audio Signal Processing

Exercise sheet 1

Exercise 1.1:

a) $(4-i) \cdot (2+i)$
 $= (4 \cdot 2 - (-1) \cdot (1)) + i(4 \cdot 1 + (-1) \cdot 2)$
 $= (8+1) + i(4-2)$
 $= 9 + i2$ so $a=9$ and $b=2$ ✓

b) $(1+2i)^{-1}$
Using $(a+ib)^{-1} = \frac{a}{a^2+b^2} - i \frac{b}{a^2+b^2}$,
 $= \frac{1}{1^2+2^2} - i \frac{2}{1^2+2^2}$
 $= \frac{1}{1+4} - i \frac{2}{1+4}$
 $= \frac{1}{5} - i \frac{2}{5}$ ✓
 ~~$= 0,2 - i0,4$, so $a=0,2$ and $b=-0,4$~~

c) $2e^{2\pi i} + e^{i\pi/2}$
Using Euler's Formula $e^{iz} = \cos(z) + i \sin(z)$,
 $= 2(\cos(2\pi) + i \sin(2\pi)) + (\cos(\frac{\pi}{2}) + i \sin(\frac{\pi}{2}))$
 $= 2(1 + i0) + (0 + i(1))$
 $= 2 + i$ so $a=2$ and $b=1$ ✓

d) $4\left(\frac{1-i}{1+i}\right)^2$
 $= 4\left(\frac{1 \cdot 1 + (-1) \cdot 1}{1^2+1^2} + i \frac{(-1) \cdot 1 - 1 \cdot 1}{1^2+1^2}\right)^2 = 4(0 + i(-1))^2 = 4(0-i)(0-i) = 4i^2$
 $= -4$, so $a=-4$ and $b=0$ ✓

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1.1	1.2	Σ
8	4	12
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