

# Further Pure 1

## Complex Numbers

### Exercise B

$$4(i) \quad (1+j)z = 3+j$$

$$\begin{aligned} z &= \frac{3+j}{1+j} \\ &= \frac{(3+j)(1-j)}{(1+j)(1-j)} \\ &= \frac{3-3j+j+1}{1+1} \\ &= \frac{4-2j}{2} \\ &= 2-j \end{aligned}$$

$$(ii) \quad (3-4j)(z-1) = 10-5j$$

$$\begin{aligned} z-1 &= \frac{10-5j}{3-4j} \\ &= \frac{(10-5j)(3+4j)}{(3-4j)(3+4j)} \\ &= \frac{30+40j-15j+20}{9+16} \\ &= \frac{50+25j}{25} \\ &= 2+j \\ z &= 3+j \end{aligned}$$

$$(iii) (2+j)(z-7+3j) = 15-10j$$

$$z-7+3j = \frac{15-10j}{2+j}$$

$$= \frac{(15-10j)(2-j)}{(2+j)(2-j)}$$

$$= \frac{30-15j-20j-10}{4+1}$$

$$= \frac{20-35j}{5}$$

$$= 4-7j$$

$$z = 7-3j+4-7j$$

$$= 11-10j$$

$$(iv) (3+5j)(z+2-5j) = 6+3j$$

$$z+2-5j = \frac{6+3j}{3+5j}$$

$$= \frac{(6+3j)(3-5j)}{(3+5j)(3-5j)}$$

$$= \frac{18-30j+9j+15}{9+25}$$

$$= \frac{33-21j}{34}$$

$$= \frac{33}{34} - \frac{21}{34}j$$

$$z = -2+5j + \frac{33}{34} - \frac{21}{34}j$$

$$= -\frac{35}{34} + \frac{149}{34}j$$