

Q1  
The hard way

$$x-6+yi = (x+1+yi)(5x-3+5yi)$$

$$\Rightarrow x-6+yi = 5x^2 - 3x + 5xyi + 5x - 3 + 5yi + 5xyi - 3yi + 5y^2i^2$$

$$\Rightarrow x-6+yi = 5x^2 + 2x + 10xyi + 2yi - 5y^2 - 3$$

$$\Rightarrow 5x^2 + x + 10xyi + yi - 5y^2 + 3 = 0$$

$$\Rightarrow 5(x+yi)^2 + (x+yi) + 3 = 0$$

$$\Rightarrow 5z^2 + z + 3 = 0$$

Q2.

Pts. A(2, 4) and B(1, 0)

Midpoint is (1.5, 2) ✓

$$\text{gradient}_{BA} = \frac{4}{-1} = -4$$

$$\text{gradient}_{AB} = \frac{-4}{-1} = 4 \quad \checkmark$$

gradient of line perpendicular is  $-\frac{1}{4}$  ✓

so for midpoint (1.5, 2)

$$y = -\frac{1}{4}x + c$$

~~2 = -\frac{1}{4}(1.5) + c~~

$$\text{so } 2 = -\frac{1}{4}\left(\frac{3}{2}\right) + c \quad \therefore c = \frac{9}{4}$$

$$\therefore 2 = -\frac{3}{8} + c$$

$$\text{so } c = \frac{19}{8} \quad \checkmark$$

Q3.

$$\begin{array}{r}
 x^3 + 6x^2 + (a+12)x + b+2a+24 \\
 x-2 \overline{) x^4 + 4x^3 + ax^2 + bx + 5} \\
 \underline{x^4 - 2x^3} \phantom{+ 0x^2 + 0x + 0} \\
 6x^3 + ax^2 \phantom{+ 0x + 0} \\
 \underline{6x^3 - 12x^2} \phantom{+ 0x + 0} \\
 (a+12)x^2 + bx \phantom{+ 0} \\
 \underline{(a+12)x^2 - (2a+24)x} \phantom{+ 0} \\
 (b+2a+24)x + 5 \\
 \underline{(b+2a+24)x - 2b-4a-48} \\
 2b+4a+53
 \end{array}$$

$$\therefore 2b+4a+53 = 37 \quad 2b+4a+53$$

$$\Rightarrow 2b+4a = 37 - 53 = -16$$