

5(iii) let  $p(x) = x^3 + 13x^2 + 32x + 20$

possible zeros are

$$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$$

$$p(-1) = (-1)^3 + 13(-1)^2 + 32(-1) + 20$$

$$= -1 + 13 - 32 + 20$$

$$= 33 - 33$$

$$= 0$$

$\therefore x+1$  is a factor of  $p(x)$  by factor theorem

$$\begin{array}{r} x^2 + 12x + 20 \\ x+1 \overline{) x^3 + 13x^2 + 32x + 20} \\ \underline{x^3 + x^2} \phantom{+ 20} \\ 12x^2 + 32x + 20 \\ \underline{12x^2 + 12x} \phantom{+ 20} \\ 20x + 20 \\ \underline{20x + 20} \\ 0 \end{array}$$

$$p(x) = (x+1)(x^2 + 12x + 20)$$

$$= (x+1)(x^2 + 10x + 2x + 20)$$

$$= (x+1)[x(x+10) + 2(x+10)]$$

$$= (x+1)(x+10)(x+2)$$

$$= (x+1)(x+2)(x+10)$$

5(iv) let

$$p(y) = 2y^3 + y^2 - 2y - 1$$

possible zeros  $\pm 1$

$$p(1) = 2 \times 1^3 + 1^2 - 2 \times 1 - 1$$

$$= 2 + 1 - 2 - 1$$

$$= 3 - 3$$

$$= 0$$

$y-1$  is a factor of  $p(y)$  by factor theorem

$$\begin{array}{r} 2y^2 + 3y + 1 \\ y-1 \overline{) 2y^3 + y^2 - 2y - 1} \\ \underline{2y^3 - 2y^2} \phantom{- 2y - 1} \\ 3y^2 - 2y - 1 \\ \underline{3y^2 - 3y} \phantom{- 1} \\ y - 1 \\ \underline{y - 1} \\ 0 \end{array}$$

$$p(y) = (y-1)(2y^2 + 3y + 1)$$

$$= (y-1)[2y^2 + 2y + y + 1]$$

$$= (y-1)[2y(y+1) + 1(y+1)]$$

$$= (y-1)(y+1)(2y+1)$$