

a) i) $\frac{3x-1}{5} = \frac{6x+5}{9} \rightarrow 9(3x-1) = 5(6x+5) \rightarrow 27x-9 = 30x+25 \rightarrow 57x-3x = 34 \rightarrow x = \frac{34}{-5}$
 $x = -11.33$

ii) $1 + \frac{5}{x} = \frac{-6}{x^2} \rightarrow x^2(1) + 5x = -6 \rightarrow x^2 + 5x = -6 \rightarrow x^2 + 5x + 6 = 0$
 $(x+2)(x+3) \rightarrow x^2 + 3x + 2x + 6 = x^2 + 5x + 6$
 $x = -2, x = -3$

iii) $2 \log(3x+1) = \log(x+3) + \log(x+7) \rightarrow (3x+1)^2 = (x+3)(x+7) \rightarrow 9x^2 + 1 = x^2 + 10x + 21$
 $9x^2 - 6x + 8x^2 - 20 = 10x \rightarrow 8x^2 + 10x - 20 = 0 \rightarrow 8x^2 - 4x - 20 = 0$
 $4x^2 - 2x - 10 = 0 \rightarrow (2x+2)(2x-5) \rightarrow 4x^2 - 5x + 4x$
 $x = \frac{-(-4) \pm \sqrt{(-4)^2 + 4(8)(-20)}}{2(8)} = \frac{-(-4) \pm \sqrt{16 - 640}}{16} \rightarrow -(-4)$

b) $8P^3Q^2 - 4P^2Q^3 + 2P^3Q \rightarrow 8P^2 - 4P^2Q - 4P^2Q^2 + 2P^3$
 $2(4P^3Q^2 - 2P^2Q^3 + P^3Q) \rightarrow 2P^2(4PQ^2 - 2Q^3 + PQ) \rightarrow 2P^2Q(4PQ - 2Q^2 + P)$

ii) $x^2 - y^2 \rightarrow x \times x - y \times y \rightarrow (x-y)(x+y) \rightarrow x^2 + xy - xy - y^2 \rightarrow x^2 - y^2$

c) i) $x^2 + 12x + 20 = 0 \rightarrow (x+10)(x+2) \rightarrow x^2 + 2x + 10x + 20$
 $x = -10, x = -2$

ii) $2x^2 + x - 15 = 0 \rightarrow (2x-5)(x+3) \rightarrow 2x^2 - 5x - 15x + 15 \rightarrow 2x^2 - 10x + 15$
 $x = -3, 2x = 5 \rightarrow x = \frac{5}{2} \rightarrow x = 2.5$

iii) $x^2 - 400 = 0 \rightarrow \sqrt{400} = 20 \rightarrow (x+20)(x-20) = x^2 - 20x + 20x - 400$
 $x = -20, x = 20$