

MA10103: Foundation Mathematics I

SOLUTIONS OF PROBLEM SHEET 2

$$1. \quad 6x^2 + x - 12 = (3x - 4)(2x + 3); \quad 4x^2 - 11x + 6 = (4x - 3)(x - 2); \quad 4x^2 + 3x - 1 = (4x - 1)(x + 1); \quad 3x^2 - 17x + 10 = (3x - 2)(x - 5); \quad 4x^2 - 12x + 9 = (2x - 3)^2; \quad 3 - 5x - 2x^2 = (-2x + 1)(x + 3) = (2x - 1)(-x - 3) = -(2x - 1)(x + 3); \quad 25x^2 - 16 = (5x + 4)(5x - 4); \quad 3 - 2x - x^2 = (-x + 1)(x + 3) = -(x - 1)(x + 3) = (x - 1)(-x - 3); \quad 5x^2 - 61x + 12 = (5x - 1)(x - 12); \quad 9x^2 + 30x + 25 = (3x + 5)^2.$$

$$2^*. \quad \frac{x-2}{4x-8} = \frac{x-2}{4 \times (x-2)} = \frac{1}{4}, \quad \frac{2x+4}{3x-6}, \quad \frac{2a+8}{3a+12} = \frac{2 \times (a+4)}{3 \times (a+4)} = \frac{2}{3}, \quad \frac{3p-3q}{5p-5q} = \frac{3 \times (p-q)}{5 \times (p-q)} = \frac{3}{5}, \quad \frac{x^2+xy}{xy+y^2} = \frac{x(x+y)}{(x+y)y} = \frac{x}{y}, \quad \frac{x-3p}{2x+p}, \quad \frac{a-4}{a-2}, \quad \frac{x^2y+xy^2}{y^2+\frac{2}{5}xy} = \frac{xy(x+y)}{\frac{1}{5}y(5y+2x)} = \frac{5x(x+y)}{5y+2x} = \frac{5x^2+5xy}{5y+2x}.$$

$$3. \quad \frac{x-2}{(x+1)(x-1)} = \frac{3}{2(x+1)} - \frac{1}{2(x-1)}; \quad \frac{2x-1}{(x-1)(x-7)} = \frac{13}{6(x-7)} - \frac{1}{6(x-1)}; \quad \frac{4}{(x+3)(x-2)} = \frac{4}{5(x-2)} - \frac{4}{5(x+3)}; \quad \frac{7x}{(2x-1)(x+4)} = \frac{7}{9(2x-1)} + \frac{28}{9(x+4)}; \quad \frac{2}{x(x-2)} = \frac{1}{x-2} - \frac{1}{x}; \quad \frac{2x-1}{(x-2)(x-1)} = \frac{3}{x-2} - \frac{1}{x-1}; \quad \frac{3}{(x-3)(x+3)} = \frac{1}{2(x-3)} - \frac{1}{2(x+3)}; \quad \frac{6x+7}{3x(x+1)} = \frac{7}{3x} - \frac{1}{3(x+1)}; \quad \frac{9}{x(2x+1)} = \frac{9}{x} - \frac{18}{2x+1}; \quad \frac{x+1}{(3x+2)(x-1)} = \frac{2}{5(x-1)} - \frac{1}{5(3x+2)}.$$

$$4^*. \quad \frac{4}{x^2-7x-8} = \frac{4}{(x-8)(x+1)} = \frac{\frac{4}{9}}{x-8} + \frac{-\frac{4}{9}}{x+1} = \frac{4}{9(x-8)} - \frac{4}{9(x+1)} = \frac{4}{9x-72} - \frac{4}{9x+9}; \quad \frac{4x}{(2x-3)(2x+3)} = \frac{1}{2x-3} + \frac{1}{2x+3}; \quad \frac{3x+2}{2x^2-4x} = \frac{3x+2}{2x(x-2)} = \frac{2}{x-2} - \frac{1}{2x} \quad \text{OR} \quad \frac{3x+2}{2x^2-4x} = \frac{3x+2}{x(2x-4)} = \frac{4}{2x-4} - \frac{1}{x} = \frac{2}{x-2} - \frac{1}{2x}; \quad \frac{3}{x^2-1} = \frac{3}{(x-1)(x+1)} = \frac{\frac{3}{2}}{x-1} - \frac{\frac{3}{2}}{x+1} = \frac{3}{2(x-1)} - \frac{3}{2(x+1)}.$$

$$5. \quad \sqrt{12} = 2\sqrt{3}; \quad \sqrt{32} = 4\sqrt{2}; \quad \sqrt{27} = 3\sqrt{3}; \quad \sqrt{35} = \sqrt{5} \times \sqrt{7} \text{ (different form only)}; \quad \sqrt{200} = 10\sqrt{2}; \quad \sqrt{72} = 6\sqrt{2}; \quad \sqrt{162} = 9\sqrt{2}; \quad \sqrt{288} = 12\sqrt{2}; \quad \sqrt{75} = 5\sqrt{3}; \quad \sqrt{48} = 4\sqrt{3}.$$

$$6. \quad \sqrt{3}(2 - \sqrt{3}) = 2\sqrt{3} - 3; \quad \sqrt{5}(2 + \sqrt{75}) \stackrel{\sqrt{75}=5\sqrt{3}}{=} 2\sqrt{5} + 5\sqrt{15}; \quad (\sqrt{3} + 1)(\sqrt{2} - 1) = \sqrt{6} - \sqrt{3} + \sqrt{2} - 1; \quad (\sqrt{5} - 1)(\sqrt{5} + 1) = 5 - 1 = 4; \quad (\sqrt{5} - 3)(2\sqrt{5} - 4) = 22 - 10\sqrt{5}; \quad (\sqrt{6} - 2)^2 = 10 - 4\sqrt{6}.$$

$$7. \quad \frac{\sqrt{7}}{6+\sqrt{7}} = \frac{\sqrt{7}(6-\sqrt{7})}{(6+\sqrt{7})(6-\sqrt{7})} = \frac{6\sqrt{7}-7}{29}; \quad \frac{2}{5-\sqrt{3}} = \frac{2(5+\sqrt{3})}{(5-\sqrt{3})(5+\sqrt{3})} = \frac{10+2\sqrt{3}}{22} = \frac{5+\sqrt{3}}{11}; \quad \frac{3-\sqrt{2}}{4-\sqrt{2}} = \frac{(3-\sqrt{2})(4+\sqrt{2})}{(4-\sqrt{2})(4+\sqrt{2})} = \frac{10-\sqrt{2}}{14}; \quad \frac{1}{\sqrt{5}-\sqrt{3}} = \frac{\sqrt{5}+\sqrt{3}}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})} = \frac{\sqrt{5}+\sqrt{3}}{2}$$