Simplifying Rational Expressions

Simplify the following:

① $\dfrac{6^2}{3_1} = 2$

② $\dfrac{3^1}{6_2} = \dfrac{1}{2}$

③ $\dfrac{13x}{6_2} = \dfrac{x}{2}$

④ $\dfrac{13x^{x^1}}{{}_2 6x} = \dfrac{x}{2}$

⑤ $\dfrac{3x+3}{6} = \dfrac{3(x+1)}{6} = \dfrac{1\cancel{3}(x+1)}{{}_2\cancel{6}} = \dfrac{x+1}{2}$

Hint: factorise the numerator

⑥ $\dfrac{6x+6}{3} = \dfrac{6(x+1)}{3} = \dfrac{{}^2\cancel{6}(x+1)}{\cancel{3}_1} = 2(x+1)$

⑦ $\dfrac{6x+3}{9} = \dfrac{3(2x+1)}{9} = \dfrac{1\cancel{3}(2x+1)}{3\cancel{9}} = \dfrac{2x+1}{3}$

⑧ $\dfrac{x^2+2x}{4x} = \dfrac{x(x+2)}{4x} = \dfrac{\cancel{x}(x+2)}{4\cancel{x}} = \dfrac{x+2}{4}$

⑨ $\dfrac{5x^2-x}{10x-2} = \dfrac{x(5x-1)}{2(5x-1)} = \dfrac{x\cancel{(5x-1)}}{2\cancel{(5x-1)}} = \dfrac{x}{2}$

⑪ $\dfrac{xy+wy}{4x+4w} = \dfrac{y\cancel{(x+w)}}{4\cancel{(x+w)}} = \dfrac{y}{4}$

(12) $\dfrac{x^2 + 3x + 2}{x+1} = \dfrac{(x+2)(x+1)}{(x+1)} = x+2$

(13) $\dfrac{x^2 + 8x + 16}{x+4} = \dfrac{(x+4)(x+4)}{(x+4)} = x+4$

(14) $\dfrac{x^2 + 7x + 12}{5x+15} = \dfrac{(x+3)(x+4)}{5(x+3)} = \dfrac{x+4}{5}$

(15) $\dfrac{x^2 - 25}{x^2 + 8x + 15} = \dfrac{(x-5)(x+5)}{(x+5)(x+3)} = \dfrac{x-5}{x+3}$

(16) $\dfrac{x^2 + 4x + 3}{x^2 + 7x + 12} = \dfrac{(x+3)(x+1)}{(x+3)(x+4)} = \dfrac{x+1}{x+4}$

(17) $\dfrac{1\;3}{1\;5} \times \dfrac{10\;^2}{9\;3} = \dfrac{2}{3}$

(18) $\dfrac{1\;3x}{5(x+2)} \times \dfrac{^2 10(x+2)}{3\,9x} = \dfrac{2}{3}$

(19) $\dfrac{x^2-25}{y} \times \dfrac{6y^2}{x+5} = \dfrac{(x-5)(x+5)}{y} \times \dfrac{6y^{\,1}}{x+5} = 6y(x-5)$

(20) $\dfrac{x^2-49}{x^2+4x+3} \div \dfrac{x+7}{x+1} = \dfrac{x^2-49}{x^2+4x+3} \times \dfrac{x+1}{x+7}$

$\qquad = \dfrac{(x-7)(x+7)}{(x+1)(x+3)} \times \dfrac{x+1}{x+7}$

$\qquad = \dfrac{x-7}{x+3}$

7