1) Simplify:

a) You may use either method to simplify this. I will use Method 2 here:

$$\frac{\frac{1}{2}+\frac{2}{3}}{\frac{1}{12}-\frac{5}{6}} = \frac{\left(\frac{1}{2}\right)\left(^{12}\right)+\left(\frac{2}{3}\right)\left(^{12}\right)}{\left(\frac{1}{12}\right)\left(^{12}\right)-\left(\frac{5}{6}\right)\left(^{12}\right)}$$

$$= \frac{(1)(6)+(2)(4)}{1-(5)(2)}$$

$$= \frac{6+8}{1-10} = \frac{14}{-9} = -\frac{14}{9}$$

b) $(a^{-4}b^2)^{-1} = (a^{-4})^{-1}\cdot(b^2)^{-1} = a^4b^{-2} = \frac{a^4}{b^2}$

c) You may use either method for this. I will use Method 1:

$$\frac{\frac{x-3}{5x^2}}{\frac{2x-6}{15}} = \frac{x-3}{5x^2}\cdot\frac{18}{2x-6} = \frac{x-3}{5x^2}\cdot\frac{18}{2(x-3)} = \frac{1}{5x^2}\cdot\frac{18}{2} = \frac{9}{5x^2}$$

2) Perform the indicated operation and reduce if possible.

a) $\frac{3x}{x-4} - \frac{12}{x-4} = \frac{3x-12}{x-4} = \frac{3(x-4)}{x-4} = 3$

b) $\frac{3}{x+2} + 2 = \frac{3}{x+2} + \frac{2(x+2)}{x+2} = \frac{3+2x+4}{x+2} = \frac{2x+7}{x+2}$

c)

$$\frac{3}{n^2-n-6} - \frac{2}{n+2} = \frac{3}{(n+2)(n-3)} - \frac{2}{n+2}$$

$$= \frac{3}{(n+2)(n-3)} - \frac{2(n-3)}{(n+2)(n-3)}$$

$$= \frac{3-2n+6}{(n+2)(n-3)}$$

$$= \frac{9-2n}{(n-2)(n+3)}$$

Solve each equation. Indicate your final answer **clearly**.

3) $\frac{3}{2x} + \frac{5}{9} = \frac{4}{3x}$

$\left(\frac{3}{2x}\right)\left(18x\right) + \left(\frac{5}{9}\right)\left(18x\right) = \left(\frac{4}{3x}\right)\left(18x\right)$

$(3)(9) + (5)(2x) = (4)(6)$

$27 + 10x = 24$

$10x = -3$

$x = -\frac{3}{10}$

4) $3 + \frac{9}{x-3} = \frac{27}{x^2-3x}$

$3x(x-3) + \left(\frac{9}{x-3}\right)\left(x(x-3)\right) = \left(\frac{27}{x(x-3)}\right)\left(x(x-3)\right)$

$3x^2 - 9x + 9x = 27$

$3x^2 = 27$

$x^2 = 9$

$x = \pm\sqrt{9} = \pm 3$ [the Square Root property]

Substituting back into the original equation, $x = 3$ gives a 0 denominator, so there is one solution: $x = -3$

Simplify completely. Write your answers with only natural number exponents.

5) $\left(9r^{-3}c^{12}\right)\left(4rc^{-8}\right) = 36r^{-2}c^4 = \frac{36c^4}{r^2}$

6) $\left(\frac{x^{-2}}{y^{-3}}\right)^{18} = \frac{\left(x^{-2}\right)^{18}}{\left(y^{-3}\right)^{18}} = \frac{x^{-36}}{y^{-54}} = \frac{y^{54}}{x^{36}}$