1. Find all values of the variable for which the rational expression is undefined

   (a) $\dfrac{1}{x}$

   (b) $\dfrac{1}{x-1}$

   (c) $\dfrac{x-1}{x-1}$

   (d) $\dfrac{2x}{(x-1)(x-2)}$

   (e) $\dfrac{2x+1}{5x-1}$

   (f) $\dfrac{3-2x}{3x^2+4x+1}$

2. Pick numbers a and b to show the following cancellation is not valid

$$\frac{2\cancel{a}+b}{\cancel{a}} = 2+b$$

3. Pick an x to show the following cancellation is not valid

$$\frac{3\cancel{(x-2)}+5}{\cancel{(x-2)}} = 3+5$$

4. Simplify the following rational expressions, assume no denominators are zero

   (a) $\dfrac{(2x+1)-(2x-2)}{3\cdot(2x+1)}$

   (b) $\dfrac{(x+2)}{4x+8}$

   (c) $\dfrac{x^2+4x+3}{x^2-4x-21}$

   (d) $\dfrac{a^2+b^2}{a+b}$

5. Perform the operation and simplify, assume no denominators are zero

   (a) $(x^2+6x+8)\cdot\left(\dfrac{x^2-x-12}{x^2-16}\right)$

   (b) $\left(\dfrac{x^3+2x^2-x-2}{x^2+5x+6}\right)\cdot\left(\dfrac{x^2-2x-15}{x^2-6x+5}\right)$

   (c) $\left(\dfrac{3x^2+5x-2}{12x^2-13x+3}\right)\div\left(\dfrac{x^2+3x+2}{4x^2+5x-6}\right)$

   (d) $\dfrac{2x^2+5x-3}{x^2+2x-3}\div\left(\dfrac{2x^2-5x+2}{x^2-9x+14}\cdot\dfrac{x^2+2x-35}{x^2-6x+5}\right)$

6. Find the least common multiple of the following pairs

   (a) 12 and 16

   (b) $9x^3$ and $3x^4$

   (c) $x-3$ and x^2-9

   (d) $x^4y^2z^5$ and wxy^3z^4

   (e) $2x^3+6x^2$ and x^2+3x

7. Pick numbers a and b to show the following equality is not valid

$$\frac{a}{b} = \frac{a^2}{b^2}.$$

8. Add or subtract the fractions and simplify

   (a) $\dfrac{2}{5}+\dfrac{6}{25}$

   (b) $\dfrac{2}{15}+\dfrac{3}{9}$

(c) $\dfrac{1}{9} - \dfrac{1}{6}$

(d) $\dfrac{1}{9} - \dfrac{1}{6a}$

(e) $\dfrac{3}{2a^2} + \dfrac{1}{4a}$

(f) $\dfrac{a}{b} + \dfrac{c}{d}$

(g) $\dfrac{2x}{x+1} - \dfrac{3}{3x-2}$

(h) $\dfrac{3}{x+1} - \dfrac{2}{x-1} + \dfrac{x+3}{x^2-1}$

9. Simplify

$$\dfrac{2+4x}{x^2-25} + \dfrac{x}{x^2+2x-35} + \dfrac{2x}{(x-5)(x^2+12x+35)}$$

10. Simplify the following, assume no denominators are zero

(a) $\dfrac{(x+2)^2 - 8x}{(x-2)}$

(b) $\left(\dfrac{1}{x+2} - \dfrac{1}{x-2} \right)^2$

(c) $\left(2 + \dfrac{4x}{x^2-1} - \dfrac{2}{x-1} \right) \cdot \left(\dfrac{x^2+2x-3}{2x^2+4x} \right)$

(d) $\left(\dfrac{x}{x^2-6x+8} \right) \div \left(x+2+ \dfrac{4}{x-2} \right)$

(e) $\left(\dfrac{x}{x-1} - \dfrac{x+1}{2x-2} + x \right) \div \left(\dfrac{2x^2+x}{2x} \right)$