Chapter 6

Chapter 6 REVIEW

Assignment

Complete pgs. 352 - 354

Questions

4, 6b, 9, 10(a-d), 11ab,15(a-d) and 20(a-d)

Solutions

4. What is the numerical value for each rational expression? Identify any non-permissible values.

a) $\frac{2s-8s}{s}$

$= \frac{-6\cancel{s}}{\cancel{s}}$

$= -6, s \neq 0$

b) $\frac{5x-3}{3-5x}$

$= \frac{5x-3}{-5x+3}$

$= \frac{\cancel{5x-3}}{-1(\cancel{5x-3})}$

$= \frac{1}{-1}$

$= -1, x \neq \frac{3}{5}$

$3-5x \neq 0$

$\frac{3}{5} \neq \frac{5x}{5}$

$\frac{3}{5} \neq x$

c) $\frac{2-b}{4b-8}$

$= \frac{-b+2}{4b-8}$

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

$= \frac{-1}{4}, b \neq 2$

$4b-8 \neq 0$

$\frac{4b}{4} \neq \frac{8}{4}$

$b \neq 2$

Solutions

6b) Simplify. Determine all non-permissible values for the variables.

i) $\frac{3x^2-13x-10}{3x+2}$

$= \frac{(3x^2-15x+2x-10)}{3x+2}$

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

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

$= x-5,\ x \neq -2/3$

$-15 \times 2 = -30$

$-15 + 2 = -13$

$3x+2 \neq 0$

$\frac{3x}{3} \neq \frac{-2}{3}$

$x \neq -\frac{2}{3}$

ii) $\frac{a^2-3a}{a^2-9}$

$= \frac{a(a-3)}{(a-3)(a+3)}$

$= \frac{a}{a+3},\ a \neq \pm 3$

$a-3 \neq 0 \quad a+3 \neq 0$

$a \neq 3 \quad a \neq -3$

iii) $\frac{3y-3x}{4x-4y}$

$= \frac{-3x+3y}{4x-4y}$

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

$= -\frac{3}{4},\ x \neq y$

$4x-4y \neq 0$

$\frac{4x}{4} \neq \frac{4y}{4}$

$x \neq y$

Solutions

iv) $\frac{81x^2-36x+4}{18x-4}$ $\quad -18 \times -18 = 324$, $-18 + -18 = -36$

$= \frac{(81x^2-18x-18x+4)}{2(9x-2)}$

$= \frac{9x(9x-2)-2(9x-2)}{2(9x-2)}$

$= \frac{(9x-2)(9x-2)}{2(9x-2)}$

$= \frac{9x-2}{2}, x \neq \frac{2}{9}$

$9x-2 \neq 0$

$9x \neq 2$

$x \neq \frac{2}{9}$

9. Simplify each product. Determine all non-permissible values.

a) $\frac{2p}{r} \times \frac{10q}{8p}$

$= \frac{(2)(10q)}{(r)(8)}$

$= \frac{20q}{8r}$

$= \frac{5q}{2r}, r \neq 0, p \neq 0$

b) $4m^3t \times \frac{1}{16mt^3}$

$= \frac{4m^2}{16t^3}$

$= \frac{m^2}{4t^3}, m \neq 0, t \neq 0$

c) $\frac{3a+3b}{8} \times \frac{4}{a+b}$

$= \frac{3(a+b)}{8} \times \frac{4}{a+b}$

$= \frac{(3)(4)}{8}$

$= \frac{12}{8}$

$= \frac{3}{2}, a \neq -b$

d) $\frac{x^2-4}{x^2+25} \times \frac{2x^2+10x}{x^2+2x}$

$= \frac{(x-2)(x+2)}{x^2+25} \times \frac{2x(x+5)}{x(x+2)}$

$= \frac{2(x-2)(x+5)}{x^2+25}, x \neq 0, -2$

Solutions

e) $\frac{d^2+3d+2}{2d+2} \times \frac{2d+6}{d^2+5d+6}$

$= \frac{(d+1)(d+2)}{2(d+1)} \times \frac{2(d+3)}{(d+2)(d+3)}$

$= 1, d \neq -1, -2, -3$

f) $\frac{y^2-8y-9}{y^2-10y+9} \times \frac{y^2-9y+8}{y^2-1} \times \frac{y^2-25}{5-y}$

$= \frac{(y+1)(y-9)}{(y-1)(y-9)} \times \frac{(y-1)(y-8)}{(y-1)(y+1)} \times \frac{(y-5)(y+5)}{-y+5}$

$= \frac{(y-8)}{(y-1)} \times \frac{(y-5)(y+5)}{-1(y-5)}$

$= \frac{(y-8)(y+5)}{-1(y-1)}$

$= \frac{-1(y-8)(y+5)}{(y-1)}, y \neq 1, 9, -1, 5$

10. Divide. Express answers in simplest form. Identify any non-permissible values.

a) $2t \div \frac{1}{4}$

$= 2t \times \frac{4}{1}$

$= \frac{8t}{1}$

$= 8t$

Solutions

b) $\frac{a^3}{b^4} \div \frac{a^3}{b^3}$

$= \frac{\cancel{a^3}}{b^4} \times \frac{b^3}{\cancel{a^3}}$

$= \frac{1}{b}, \quad a \neq 0, b \neq 0$

c) $\frac{7}{x^2-y^2} \div \frac{-35}{x-y}$

$= \frac{7}{\cancel{(x-y)}(x+y)} \times \frac{\cancel{x-y}}{-35}$

$= \frac{7}{-35(x+y)}$

$= \frac{-1}{5(x+y)}, \quad x \neq \pm y$

d) $\frac{3a+9}{a-3} \div \frac{a^2+6a+9}{a-3}$

$= \frac{3(a+3)}{a-3} \div \frac{(a+3)(a+3)}{a-3}$

$= \frac{3(\cancel{a+3})}{\cancel{a-3}} \times \frac{\cancel{a-3}}{(a+3)(\cancel{a+3})}$

$= \frac{3}{a+3}, \quad a \neq \pm 3$

Solutions

11. Multiply or divide as indicated. Express answers in simplest form. Determine all non-permissible values.

a) $\frac{9}{2m} \div \frac{3}{m} \times \frac{m}{3}$

$= \frac{9}{2m} \times \frac{m}{3} \times \frac{m}{3}$

$= \frac{9(m)}{(2)(3)(3)}$

$= \frac{9m}{18}$

$= \frac{m}{2}, m \neq 0$

b) $\frac{x^2-3x+2}{x^2-4} \times \frac{x+3}{x^2+3x} \div \frac{1}{x+2}$

$= \frac{(x-1)(x-2)}{(x-2)(x+2)} \times \frac{x+3}{x(x+3)} \times x+2$

$= \frac{x-1}{x}, x \neq \pm 2, 0, -3$

15. Add or subtract. Express answers in simplest form. Identify any non-permissible values.

a) $\frac{4x-3}{6} - \frac{x-2}{4}$

$= \frac{2(4x-3)}{12} - \frac{3(x-2)}{12}$

$= \frac{2(4x-3)-3(x-2)}{12}$

$= \frac{8x-6-3x+6}{12}$

$= \frac{5x}{12}$

Solutions

b) $\frac{2y-1}{3y} + \frac{y-2}{2y} - \frac{y-8}{6y}$

$= \frac{2(2y-1)}{6y} + \frac{3(y-2)}{6y} - \frac{y-8}{6y}$

$= \frac{4y-2}{6y} + \frac{3y-6}{6y} - \frac{(y-8)}{6y}$

$= \frac{4y-2+3y-6-y+8}{6y}$

$= \frac{6y}{6y}$

$= 1, \; y \neq 0$

c) $\frac{9}{x-3} + \frac{7}{x^2-9}$

$= \frac{9}{x-3} + \frac{7}{(x-3)(x+3)}$

$= \frac{9(x+3)}{(x-3)(x+3)} + \frac{7}{(x-3)(x+3)}$

$= \frac{9x+27+7}{(x-3)(x+3)}$

$= \frac{9x+34}{(x-3)(x+3)}, \; x \neq \pm 3$

d) $\frac{a}{a+3} - \frac{a^2-3a}{a^2+a-6}$

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

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

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

$= \frac{a}{(a+3)(a-2)}, \; a \neq -3, 2$

Solutions

20. Solve each rational equation. Identify all non-permissible values.

a) $\frac{s-3}{s+3} = 2$

$(s+3)\left[\frac{s-3}{s+3}\right] = (s+3)[2]$

$s-3 = 2(s+3)$

$s-3 = 2s+6$

$-3-6 = 2s-s$

$-9 = s, \quad s \neq -3$

b) $\frac{x+2}{3x+2} = \frac{x+3}{x-1}$

$(3x+2)(x-1)\left[\frac{x+2}{3x+2}\right] = (3x+2)(x-1)\left[\frac{x+3}{x-1}\right]$

$(x-1)(x+2) = (3x+2)(x+3)$

$x^2+2x-1x-2 = 3x^2+9x+2x+6$

$x^2+x-2 = 3x^2+11x+6$

$0 = 3x^2-x^2+11x-x+6+2$

$0 = 2x^2+10x+8$

$0 = 2(x^2+5x+4)$

$0 = 2(x+1)(x+4)$

$0 = x+1$ or $0 = x+4$

$-1 = x$ $\qquad -4 = x, \quad x \neq -\frac{2}{3}, 1$

Solutions

c) $\frac{z-2}{z} + \frac{1}{5} = \frac{-4}{5z}$

$5z\left[\frac{z-2}{z} + \frac{1}{5}\right] = 5z\left[\frac{-4}{5z}\right]$

$5z\left[\frac{z-2}{z}\right] + 5z\left[\frac{1}{5}\right] = 5z\left[\frac{-4}{5z}\right]$

$5(z-2) + z(1) = -4$

$5z - 10 + z = -4$

$6z = -4 + 10$

$\frac{6z}{6} = \frac{6}{6}$

$z = 1, z \neq 0$

d) $\frac{3m}{m-3} + 2 = \frac{3m-1}{m+3}$

$(m-3)(m+3)\left[\frac{3m}{m-3} + 2\right] = (m-3)(m+3)\left[\frac{3m-1}{m+3}\right]$

$(m-3)(m+3)\left[\frac{3m}{m-3}\right] + (m-3)(m+3)[2] = (m-3)(m+3)\left[\frac{3m-1}{m+3}\right]$

$3m(m+3) + 2(m-3)(m+3) = (m-3)(3m-1)$

$3m^2 + 9m + 2(m^2 + 3m - 3m - 9) = 3m^2 - m - 9m + 3$

$3m^2 + 9m + 2m^2 + 6m - 6m - 18 = 3m^2 - 10m + 3$

$5m^2 + 9m - 18 = 3m^2 - 10m + 3$

$5m^2 - 3m^2 + 9m + 10m - 18 - 3 = 0$

$2m^2 + 19m - 21 = 0 \quad -2 \times 21 = -42$

$(2m^2 - 2m + 21m - 21) = 0 \quad -2 \times 21 = 19$

$2m(m-1) + 21(m-1) = 0$

$(m-1)(2m+21) = 0$

$m - 1 = 0 \text{ or } 2m + 21 = 0$

$m = 1 \qquad \frac{2m}{2} = \frac{-21}{2}$

$m = -\frac{21}{2}, m \neq \pm 3.$