

IM 3 Review

Operations with Rational Expressions

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Hour: \_\_\_\_\_

Simplify the rational expression. State the excluded values.

$$1) \frac{x^2-25}{10x^2-50x}$$

$$\frac{(x-5)(x+5)}{10x(x-5)} \quad x \neq 0, 5$$

$$\boxed{\frac{x+5}{10x}, x \neq 0, 5}$$

$$2) \frac{3x^2-x-2}{(3x^3+2x^2)(6x+4)}$$

$$\frac{(3x+2)(x-1)}{(x^2+2)(3x+2)} \quad x \neq -2/3$$

$$\boxed{\frac{x-1}{x^2+2}, x \neq -2/3}$$

$$3) \frac{2x^2-5x+3}{x^2-1}$$

$$\frac{(2x-3)(x-1)}{(x-1)(x+1)} \quad x \neq 1, -1$$

$$\boxed{\frac{2x-3}{x+1}, x \neq 1, -1}$$

Multiply or divide the rational expressions. State the excluded values.

$$4) \frac{5x^2 \cdot 12x}{9y^2 \cdot 20x}$$

$$\frac{3y}{41}$$

$$\boxed{\frac{x^2}{3y}, x \neq 0, y \neq 0}$$

$$5) \frac{y^2-49}{(y-7)^2} \div \frac{y^2+7y}{5y-35}$$

$$\frac{(y-7)(y+7)}{(y-7)(y-7)} \cdot \frac{5(y-7)}{y(y+7)}$$

$$\frac{5}{y} \quad y \neq 7, -7, 0, 7$$

$$\boxed{\frac{5}{y}, y \neq -7, 0, 7}$$

$$6) \frac{5y-20}{3y+15} \cdot \frac{7y+35}{10y+40}$$

$$\frac{5(y-4)}{3(y+5)} \cdot \frac{7(y+5)}{10(y+4)}$$

$$\frac{7(y-4)}{6(y+4)} \quad y \neq -4, -5$$

$$\boxed{\frac{7(y-4)}{6(y+4)}, y \neq -5, -4}$$

$$7) \frac{x^2+2x-8}{x^2} \cdot \frac{x^2-3x}{x^2+x-12}$$

$$\frac{(x+4)(x-2)}{x \cdot x^2} \cdot \frac{x(x-3)}{(x+4)(x-3)}$$

$$\frac{x-2}{x} \quad x \neq -4, 0, 3$$

$$\boxed{\frac{x-2}{x}, x \neq -4, 0, 3}$$

$$8) \frac{x^2}{x+7} \cdot \frac{x^2+11x+28}{x^2+4x}$$

$$\frac{\cancel{x}^2}{\cancel{x}+7} \cdot \frac{\cancel{(x+7)}\cancel{(x+4)}}{\cancel{x}(x+4)} \quad x \neq -7, 0, -4$$

$$\boxed{x, x \neq -7, -4, 0}$$

$$9) \frac{x^2+10x+16}{x^2-6x-16} \div \frac{x+8}{x^2-64}$$

$$\frac{(x+8)\cancel{(x+2)}}{\cancel{(x-8)}(x+2)} \cdot \frac{\cancel{(x-8)}(x+8)}{(x+8)} \quad x \neq 8, -8, -2$$

$$\boxed{x+8, x \neq -8, -2, 8}$$

$$10) \frac{3x-12}{2x^2-8x} \div \frac{x^2+x-6}{x^3-4x}$$

$$\frac{3\cancel{(x-4)}}{2x\cancel{(x-4)}} \cdot \frac{\cancel{x}\cancel{(x-2)}(x+2)}{(x+3)\cancel{(x-2)}} \quad x \neq 0, 2, -2, 4, -3$$

$$\boxed{\frac{3(x+2)}{2(x+3)}, x \neq -3, -2, 0, 2, 4}$$

$$11) \frac{x^2-3x-10}{2x^2-11x+5} \cdot \frac{2x^2-7x+3}{x^2-5x+6}$$

$$\frac{\cancel{(x-5)}(x+2)}{(2x-1)\cancel{(x-5)}} \cdot \frac{(2x-1)\cancel{(x-3)}}{\cancel{(x-3)}(x-2)} \quad x \neq 1/2, 5, 3, 2$$

$$\boxed{\frac{x+2}{x-2}, x \neq 1/2, 2, 3, 5}$$

**Add or subtract the rational expressions.**

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

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

$$\frac{4x+8}{(x-4)(x+2)} \pm \frac{-3x+12}{(x+2)(x-4)}$$

$$\boxed{\frac{x+20}{(x-4)(x+2)}, x \neq 4, -2}$$

$$13) \frac{2x-3}{x+5} + \frac{x^2-4x-19}{x^2+8x+15}$$

$$\frac{2x-3}{x+5} \frac{(x+3)}{(x+3)} + \frac{x^2-4x-19}{(x+5)(x+3)}$$

$$\frac{2x^2+6x-3x-9}{(x+5)(x+3)} + \frac{x^2-4x-19}{(x+5)(x+3)}$$

$$\boxed{\frac{3x^2-x-28}{(x+5)(x+3)}, x \neq -5, -3}$$

$$14) \frac{3x \cdot 4x}{3x \cdot x-2} - \frac{x+1}{3x} \frac{(x-2)}{(x-2)}$$

$$\frac{12x^2}{3x(x-2)} + \frac{-x^2+2x+(x+2)}{3x(x-2)}$$

$$\boxed{\frac{11x^2 + x + 2}{3x(x-2)} \quad x \neq 0, 2}$$

$$15) \frac{5x+4}{x^2-64} + \frac{3}{x-8} \frac{(x+8)}{(x+8)}$$

$$\frac{5x+4}{(x+8)(x-8)} + \frac{3x+24}{(x+8)(x-8)}$$

$$\frac{8x+28}{(x+8)(x-8)} = \frac{4(2x+7)}{(x+8)(x-8)}, x \neq 8, -8$$

Simplify the complex fraction.

$$16) \left( \frac{3+\frac{2}{y}}{5-\frac{y}{7}} \right) 7y$$

$$\frac{21y + 14}{35y - y^2}$$

$$\boxed{\frac{7(3y+2)}{-y(y-35)}}$$

$$17) \left( \frac{\frac{7}{x-2}}{\frac{5}{x} + \frac{1}{x-2}} \right) (x-2)(x)$$

$$\frac{7x}{5(x-2) + x}$$

$$\frac{7x}{5x-10+x}$$

$$\frac{7x}{6x-10} = \boxed{\frac{7x}{2(3x-5)}}$$

$$18) \left( \frac{\frac{5}{4} + \frac{3}{x+4}}{\frac{4x}{x+4} - \frac{1}{x}} \right) 4(x)(x+4)$$

$$\frac{5x(x+4) + 12x}{16x^2 - 4(x+4)} = \frac{5x^2 + 20x + 12x}{16x^2 - 4x - 16}$$

$$\frac{5x^2 + 32x}{4(4x^2 - x - 4)} = \boxed{\frac{x(5x+32)}{4(4x^2-x-4)}}$$

Solve the equation  $x \neq 2, -6$

$$19. \frac{x-3}{x-2} = \frac{9}{x+6}$$

$$9(x-2) = (x-3)(x+6)$$

$$9x-18 = x^2+3x-18$$

$$0 = x^2 - 6x$$

$$0 = x(x-6)$$

$$\boxed{x=0, x=6}$$

$$21. \frac{1}{x+6} + \frac{x+1}{x} = \frac{13}{x+6} \quad x(x+6) \quad x \neq 0, -6$$

$$x + (x+1)(x+6) = 13x$$

$$x + x^2 + 7x + 6 = 13x$$

$$x^2 + 8x + 6 = 13x$$

$$x^2 - 5x + 6 = 0$$

$$(x-3)(x-2) = 0$$

$$\boxed{x=2, 3}$$

$$20. \frac{5}{x-2} - \frac{2}{x+2} = \frac{3}{x^2-4} \quad (x-2)(x+2) \quad x \neq 2, -2$$

$$5(x+2) - 2(x-2) = 3$$

$$5x+10 - 2x+4 = 3$$

$$3x+14 = 3$$

$$3x = -11$$

$$\boxed{x = -11/3}$$

$$22. \frac{5}{x^2-7x+12} = \frac{2}{x-3} + \frac{5}{x-4} \quad (x-3)(x-4) \quad x \neq 3, 4$$

$$5 = 2(x-4) + 5(x-3)$$

$$5 = 2x-8 + 5x-15$$

$$5 = 7x-23$$

$$28 = 7x$$

$$x = 4$$

NO solution

Solve the Inequality.

$$23. \frac{x^2-6x+5}{x^2-25} < 0$$

$$\frac{(x-5)(x-1)}{(x-5)(x+5)} < 0$$

Zeros:  $\{1, 5\}$

discontinuities:  $\{-5, 5\}$



$$(-5, 1)$$

$$24. \frac{x^2-11x+30}{x-1} \geq 0$$

$$\frac{(x-5)(x-6)}{(x-1)} \geq 0$$

Zeros:  $\{5, 6\}$

discontinuities:  $\{1\}$



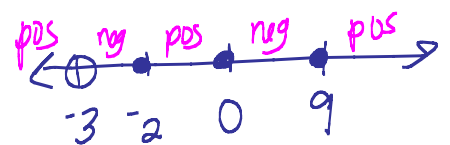
$$(1, 5] \cup [6, \infty)$$

$$25. \frac{x^3-7x^2-18x}{x+3} \leq 0$$

$$\frac{x(x-9)(x+2)}{x+3} \leq 0$$

Zeros:  $\{0, 9, -2\}$

discontinuities:  $\{-3\}$



$$(-3, -2] \cup [0, 9]$$

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