Name Answer Key Date ____________ Period ________

Accelerated Geometry
End of Year Algebra Review #2

Guidelines to Simplifying Rational Expressions:

- Factor the numerator, if possible
- Factor the denominator, if possible
- Look for common factors, if any
- Cancel common factors

Express in simplest form. Assume no denominator equals zero.

1. $\dfrac{x^2+6x+8}{x^2+8x+16} = \dfrac{\cancel{(x+4)}(x+2)}{\cancel{(x+4)}(x+4)}$

$\boxed{\dfrac{x+2}{x+4}}$

2. $\dfrac{a^2+a-2}{8-2a^2}$ $\dfrac{(a+2)(a-1)}{-2a^2+8} = \dfrac{\cancel{(a+2)}(a-1)}{-2\cancel{(a+2)}(a-2)}$

$-2(a^2-4)$

$\boxed{-\dfrac{a-1}{2(a-2)}}$

3. $\dfrac{2n^2+5n+3}{n^3+n^2} = \dfrac{(2n+3)\cancel{(n+1)}}{n^2\cancel{(n+1)}}$

$\boxed{\dfrac{2n+3}{n^2}}$

4. $\dfrac{3x^2+6x-24}{3x^2-2x-8} = \dfrac{3(x^2+2x-8)}{(3x+4)(x-2)} = \dfrac{3(x+4)\cancel{(x-2)}}{(3x+4)\cancel{(x-2)}}$

$\boxed{\dfrac{3(x+4)}{3x+4}}$

Guidelines to Multiplying Rational Expressions:

- Factor the numerator and denominator of each fraction.
- Cancel common factors:
  - Up and Down and Diagonally
- Multiply numerator by numerator and denominator by denominator

Guidelines to Dividing Rational Expressions:

- Rewrite the problem into a multiplication problem.
  - First Fraction stays the same
  - Division sign changes to a multiplication sign
  - Take the reciprocal of the second fraction
- Factor the numerator and denominator of each fraction.
- Cancel common factors:
  - Up and Down and Diagonally
- Multiply numerator by numerator and denominator by denominator

Multiply or Divide. Assume no denominator equals zero.

5. $\dfrac{2d-3e}{f^3} \bullet \dfrac{f}{3e-2d}$

$\dfrac{\cancel{2d-3e}}{\cancel{f}^3} \cdot \dfrac{\cancel{f}}{-1(\cancel{2d-3e})}$

f^2

$\boxed{-\dfrac{1}{f^2}}$

6. $\dfrac{3ab}{9-b^2} \bullet \dfrac{2ab-6a}{6a^2b}$

$\dfrac{\cancel{3ab}}{-1(\cancel{b-3})(b+3)} \cdot \dfrac{\cancel{2a}(\cancel{b-3})}{\cancel{6}\cancel{a^2}\cancel{b}}$

$2 \quad a$

$\boxed{-\dfrac{1}{b+3}}$

7. $\dfrac{y}{2x^3} \div \left(\dfrac{y}{2x}\right)^2$

$\dfrac{\cancel{y}}{\cancel{2}\cancel{x}^3} \cdot \dfrac{\cancel{4}\cancel{x}^2}{\cancel{y}^2} = \boxed{\dfrac{2}{xy}}$

$2 \quad y \quad 2$

8. $\dfrac{a^2-a-12}{a^2-4a} \div \dfrac{a^2+2a-3}{2a^2}$

$\dfrac{a^2-a-12}{a^2-4a} \cdot \dfrac{2a^2}{a^2+2a-3}$

$\dfrac{(\cancel{a-4})(\cancel{a+3})}{\cancel{a}(\cancel{a-4})} \cdot \dfrac{2a^2}{(\cancel{a+3})(a-1)}$

a

$\boxed{\dfrac{2a}{a-1}}$

9. $\dfrac{ac+ad}{ac-ad} \div \dfrac{5c+5d}{c^2-d^2}$

$\dfrac{ac+ad}{ac-ad} \cdot \dfrac{c^2-d^2}{5c+5d}$

$\dfrac{\cancel{a}(c+d)}{\cancel{a}(\cancel{c-d})} \cdot \dfrac{(\cancel{c-d})(\cancel{c+d})}{5(\cancel{c+d})}$

$\boxed{\dfrac{c+d}{5}}$

10. $\dfrac{d^2+9d+18}{2d^2+4d} \div \dfrac{d^2+d-6}{d^2-4}$

$\dfrac{d^2+9d+18}{2d^2+4d} \cdot \dfrac{d^2-4}{d^2+d-6}$

$\dfrac{(\cancel{d+3})(d+6)}{2d(\cancel{d+2})} \cdot \dfrac{(\cancel{d-2})(\cancel{d+2})}{(\cancel{d+3})(\cancel{d-2})}$

$\boxed{\dfrac{d+6}{2d}}$

Guidelines to Adding and Subtracting Expressions:

1. Check to see if the fractions have the same denominator.
2. If not, find the least common multiple of the denominators
3. Rewrite the problem using the LCD.
4. Add/subtract the numerators and keep the same denominator.
5. Simplify your answer by looking for common factors.

Recall: You may have to factor to simplify.

Add or Subtract. Assume no denominator equals zero.

11. $\frac{4a^2}{a^2+a} - \frac{3a^2+1}{a^2+a}$

$\frac{4a^2-3a^2-1}{a^2+a} = \frac{a^2-1}{a^2+a}$

$= \frac{(a-1)\cancel{(a+1)}}{a\cancel{(a+1)}} = \boxed{\frac{a-1}{a}}$

12. $\frac{2}{x-1}\cdot 4 + \frac{9}{4x-4}$ LCD $= 4(x-1)$

$4(x-1)$

$\frac{8}{4(x-1)} + \frac{9}{4(x-1)} = \boxed{\frac{17}{4(x-1)}}$

13. $\frac{6a-10}{a^2-a-12} + \frac{-4}{a+3}(a-4)$ LCD $= (a+3)(a-4)$

$(a+3)(a-4)$

$\frac{6a-10}{(a+3)(a-4)} + \frac{-4a+16}{(a+3)(a-4)}$

$\frac{2a+6}{(a+3)(a-4)} = \frac{2\cancel{(a+3)}}{\cancel{(a+3)}(a-4)} = \boxed{\frac{2}{a-4}}$

14. $\frac{3a}{a-2b} + \frac{6b}{2b-a}$

$-a+2b$

$-1(a-2b)$

$\frac{3a}{a-2b} - \frac{6b}{a-2b} = \frac{3a-6b}{(a-2b)}$

$= \frac{3\cancel{(a-2b)}}{\cancel{(a-2b)}} = \boxed{3}$

15. $2a\frac{(a+3)}{6a^2-12a} + \frac{5}{12a^2}(a-2)$ LCD $= 12a^2(a-2)$

$6a(a-2)$

$\frac{2a^2+6a}{12a^2(a-2)} + \frac{5a-10}{12a^2(a-2)} = \boxed{\frac{2a^2+11a-10}{12a^2(a-2)}}$

16. $\frac{3}{1}(x^2-1) - \frac{2x-2}{x^2-1}$ LCD $= x^2-1$

$\frac{3x^2-3}{x^2-1} - \frac{2x-2}{x^2-1}$

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

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

Simplify. Assume no denominator equals zero.

17. $\frac{x}{x+2}(x-2) - \frac{4}{x-2}(x+2) - 1(x^2-4)$ LCD $= (x+2)(x-2)$

$\frac{x^2-2x}{(x+2)(x-2)} - \frac{4x+8}{(x+2)(x-2)} - \frac{x^2-4}{(x+2)(x-2)}$

$\frac{\cancel{x^2}-2x-4x-8-\cancel{x^2}+4}{(x+2)(x-2)}$

$\boxed{\frac{-6x-4}{(x+2)(x-2)}} = \frac{-2(3x+2)}{(x+2)(x-2)}$ Nothing cancels!

18. $\dfrac{z-\frac{5z}{z+5}}{z+\frac{5z}{z-5}}$ ← Simplify numerator ← Simplify denominator

$\frac{z}{1}(z+5) - \frac{5z}{z+5}$

$\frac{z^2+5z}{z+5} - \frac{5z}{z+5} = \frac{z^2+\cancel{5z}-\cancel{5z}}{z+5} = \frac{z^2}{z+5}$ numerator

$\frac{z}{1}(z-5) + \frac{5z}{z-5}$

$\frac{z^2-5z}{z-5} + \frac{5z}{z-5} = \frac{z^2-\cancel{5z}+\cancel{5z}}{z-5} = \frac{z^2}{z-5}$ denominator

$\frac{z^2}{z+5} \div \frac{z^2}{z-5} = \frac{z^2}{z+5}\cdot\frac{z-5}{z^2} = \boxed{\frac{z-5}{z+5}}$ ← final answer

Polynomial Long Divison

- Polynomials must be in descending order.
- If its missing a term, use 0 as its coefficient so that every term is expressed.
- If there's a remainder, be sure to express as $\pm\frac{remainder}{divisor}$ as part of the quotient.

Use polynomial long division to find the quotient.

19. $2x-4\overline{)2x^3-10x^2+14x-4}$

$\boxed{x^2-3x+1}$

$-2x^3+4x^2$

$-6x^2+14x$

$+6x^2-12x$

$2x-4$

$-2x+4$

20. $\dfrac{45-13n+n^2}{n-5}$ Watch order!

$\boxed{n-8+\frac{5}{n-5}}$

$n-5\overline{)n^2-13n+45}$

$-n^2+5n$

$-8n+45$

$+8n-40$

5

21. $\dfrac{a^3+27}{a+3}$ missing terms!

$\boxed{a^2-3a+9}$

$a+3\overline{)a^3+0a^2+0a+27}$

$-a^3-3a^2$

$-3a^2+0a$

$+3a^2+9a$

$9a+27$

$-9a-27$

22. $(6x^3+11x^2-14x-10)\div(2x+5)$

$\boxed{3x^2-2x-2}$

$2x+5\overline{)6x^3+11x^2-14x-10}$

$-6x^3-15x^2$

$-4x^2-14x$

$+4x^2+10x$

$-4x-10$

$+4x+10$