

1. Express the following statement as an inequality:

The quotient of  $a$  and  $b$  is at most  $\frac{1}{3}$ .

$$\boxed{\frac{a}{b} \leq \frac{1}{3}}$$

2. Simplify. Do not leave negative exponents in your answer.

$$\left(\frac{1}{3}a^8\right)(12a^{-5})(2a^{-7})$$

$$= (4a^3)(2a^{-7})$$

$$= 8a^{-4}$$

$$= \boxed{\frac{8}{a^4}}$$

3. Simplify. Do not leave negative exponents in your answer.

$$\left(\frac{2x^8y^0}{10x^3y^4y^3}\right)^2$$

$$= \left(\frac{x^5}{5y^7}\right)^2 = \boxed{\frac{x^{10}}{25y^{14}}}$$

4. Simplify completely.

$$\begin{aligned} & \sqrt[3]{\frac{27a^{12}}{b^{18}}} \\ &= \frac{\sqrt[3]{27a^{12}}}{\sqrt[3]{b^{18}}} = \boxed{\frac{3a^4}{b^6}} \end{aligned}$$

5. Subtract and express as a polynomial.

$$\begin{aligned} & 9x^5 - 4x^2 + 8 - 2(3x^5 + 5x^3 - 3x^2 + 9) \\ &= 9x^5 - 4x^2 + 8 - 6x^5 - 10x^3 + 6x^2 - 18 \\ &= \boxed{3x^5 - 10x^3 + 2x^2 - 10} \end{aligned}$$

6. Multiply and express as a polynomial.

$$\begin{aligned} & (5x-3)(x^2+2x-4) \\ &= 5x(x^2+2x-4) - 3(x^2+2x-4) \\ &= 5x^3 + 10x^2 - 20x - 3x^2 - 6x + 12 \\ &= \boxed{5x^3 + 7x^2 - 26x + 12} \end{aligned}$$

7. Simplify completely.

$$\begin{aligned} & \frac{2x^2 - 5x - 3}{x^2 - 9} \div \frac{10x^2 + x - 2}{5x^2 - 17x + 6} \\ &= \frac{2x^2 - 5x - 3}{x^2 - 9} \cdot \frac{5x^2 - 17x + 6}{10x^2 + x - 2} \\ &= \frac{(2x+1)(x-3)}{(x+3)(x-3)} \cdot \frac{(5x-2)(x-3)}{(5x-2)(2x+1)} = \boxed{\frac{x-3}{x+3}} \end{aligned}$$

8. Subtract and simplify completely.

$$\begin{aligned} & \frac{4a}{a+3} - \frac{5}{a} \\ &= \frac{4a(a)}{a(a+3)} - \frac{5(a+3)}{a(a+3)} = \boxed{\frac{4a^2 - 5a - 15}{a(a+3)}} \end{aligned}$$

9. Which of the following is a factor of  $6x^3 + x^2 - 12x$ ?

$$\begin{aligned} &= x(6x^2 + x - 12) \\ &= x(3x - 4)(2x + 3) \end{aligned}$$

$3x - 4$  is a factor

10. Simplify completely.

$$\frac{\frac{\frac{r-s}{s} - \frac{s-r}{r-1}}{s}}$$

$$= \frac{\frac{r^2}{sr} - \frac{s^2}{sr}}{\frac{r}{s} - \frac{s}{s}} = \frac{\frac{r^2 - s^2}{sr}}{\frac{r-s}{s}} = \frac{r^2 - s^2}{sr} \cdot \frac{s}{r-s}$$

$$= \frac{(r+s)(r-s)}{r} \cdot \frac{1}{r-s} = \boxed{\frac{r+s}{r}}$$

11. Solve for  $x$ . Circle the answer that best describes the solution(s).

$$\frac{4}{2x-3} + \frac{3}{4x^2-9} = \frac{1}{2x+3}$$

$$(2x+3)(2x-3) \left[ \frac{4}{2x-3} + \frac{3}{(2x+3)(2x-3)} \right] = \left[ \frac{1}{2x+3} \right] (2x+3)(2x-3)$$

$$4(2x+3) + 3 = 1(2x-3)$$

$$8x + 12 + 3 = 2x - 3$$

$$8x + 15 = 2x - 3$$

$$6x = -18$$

$$x = -3$$

so  $x$  is between  $-6$  and  $-\frac{5}{2}$

12. Solve  $M = \frac{b^2}{a+ab}$  for  $a$ .

$$M(a+ab) = b^2$$

$$Ma + Mab = b^2$$

$$a(M+Mb) = b^2$$

$$a = \frac{b^2}{M+Mb} \quad \text{or} \quad a = \frac{b^2}{M(1+b)}$$

13. The total price of a coat sold to a customer is \$85. This total includes the wholesale price of the coat plus a 15% markup, and a 5% sales tax (after the markup has been added). Find the equation that would be used to compute the wholesale price of the coat assuming that  $x$  represents the wholesale price. Simplify your equation. Do not solve the equation.

let  $x = \text{wholesale price}$

$$\text{wholesale price} + \text{markup} + \text{sales tax} = 85$$

$$x + .15x + .05(x + .15x) = 85$$

$$x + .15x + .05x + .0075x = 85$$

$$1.2075x = 85$$

14. A mechanic needs 5 quarts of a 60% antifreeze solution. Unfortunately, she only has a 70% antifreeze solution and a 40% antifreeze solution available. How much of the 40% antifreeze solution should she use to get the 5 quarts of 60% antifreeze solution?

let  $x = \# \text{ quarts of } 40\% \text{ solution}$

$5-x = \# \text{ quarts of } 70\% \text{ solution}$

$$(.40)(x) + (5-x)(.70) = (5)(.60)$$

$$.40x + 3.5 - .70x = 3.0$$

$$4x + 35 - 7x = 30$$

$$-3x = -5$$

$$x = \frac{5}{3} \text{ quarts of } 40\% \text{ sol.}$$