

- Integer Exponents (R3)
- Polynomial Expressions (R4)
- Factoring Polynomials (R5)
- Rational Expressions (R6)
- Radical Notation and Rational Exponents (R7)
- Radical Expressions (R8)
- Numbers, Data, and Problem Solving (1.1)
- Visualization of Data (1.2)
- Functions and Their Representations (1.3)
- Function Types and Their Rates of Change (1.4)

1. Simplify and write answers using positive exponents only:

a. $\frac{2^{-3}x^2y^{-1}}{5^{-2}x^7y^{-5}}$ b. $\left(\frac{5x^7y^4}{10x^2y^{-2}}\right)^{-3}$

2. Determine the degree of the polynomial $P = 5x^2y^5 - 2x^4y^6 - 9x^7y^2$. List the terms of the polynomial.

3. Multiply and simplify: $(2m - n)(2m + n) - 2(m - n)^2$

4. Factor completely over the integers: $2x^4 + 54x$

5. Factor completely over the integers: $x^4 + 5x^2 - 36$

6. Factor completely over the integers: $4x^3 + 20x^2 - 16x - 80$

7. Factor completely over the integers: $12x^2 - 11x + 2$

8. Divide and simplify: $\frac{x^2 - 4}{x^3 + 8} \div \frac{x^2 - 4x + 4}{x^2 - 2x + 4}$

9. Subtract and simplify: $\frac{5x + 4}{x^2 + 4x} - \frac{2x + 4}{x^2 + 7x + 12}$

10. Simplify: $\frac{y^{-2} - x^{-2}}{x^{-1} - y^{-1}}$

11. Solve: $\frac{9x + 2}{3x^2 - 2x - 8} + \frac{7}{3x^2 + x - 4} = 0$

12. Assume that variables can represent any real number. Simplify: $\sqrt[4]{16x^{12}(2y - 3)^4}$

13. Convert to exponential notation and simplify: $\sqrt[5]{\sqrt[4]{17}}$

14. Express $\frac{x \cdot \sqrt[5]{x^2}}{\sqrt[4]{x^3}}$ in the form x^b , where b is a real number.

15. Assume: $(a + b) > 0$. Write as a single radical: $\frac{\sqrt{(a + b)^3} \cdot \sqrt[3]{a + b}}{\sqrt[6]{(a + b)^7}}$

16. Evaluate: $(-27)^{\frac{2}{3}}$

17. Rationalize the denominator and simplify: $\sqrt{\frac{3}{8}}$

18. Rationalize the denominator and simplify (Assume all variables are positive numbers.): $\frac{6}{\sqrt[5]{8x^2}}$

19. Rationalize the denominator and simplify: $\frac{\sqrt{2}}{8 - \sqrt{6}}$

20. Consider the numbers: 0.56 , $\sqrt{36}$, $-\sqrt{6}$, $\frac{-5}{0}$, $\frac{0}{4}$, 14 , $\frac{2}{3}$. Which are rational numbers but not integers?
21. A radioactive material produces 25 billion disintegrations per second. How many disintegrations are produced in one hour? Write the answer using scientific notation.
22. Calculate: $\frac{2.4 \times 10^5}{4.8 \times 10^{12}}$. Write the answer using scientific notation.
23. The average life expectancy of a male born in 1980 was 70.3 years and for a male born in 2000 it was 73.4 years. Estimate the average life expectancy of a male born in 1990.
24. Given the relation: $\{(10,50), (-35,45), (0,-55), (75,25), (-25,-25)\}$, find:
- The domain of the relation.
 - The range of the relation.
 - The median value of the domain.
 - The average value (mean) of the range.
25. Given: $f(x) = \frac{3x-5}{x+5}$
- Evaluate $f(x)$ at $x = -1$, $a + 2$, and -5
 - Find the domain of $f(x)$
26. Determine whether the following set of ordered pairs is a function or not: $\{(a,2), (a,3), (b,5), (-b,7)\}$
27. A train is initially 200 miles from the station and moving toward the station at 40 miles per hour.
- Write a symbolic representation (formula) for a function, D , that calculates the distance the train is from the station after x hours.
 - How far is the train from the station after 3 hours?
 - Find the slope of the graph of D . Interpret this slope as a rate of change.
28. Write a symbolic representation (formula) for a function, f , that computes the monthly electric bill in dollars for using x kilo-watt hours at 6 cents per kilo-watt hour plus a fixed fee of \$6.50.
29. Calculate the average rate of change of $f(x) = 3x^2 + 2x$ as x goes from $x=1$ to $x=3$.
30. Calculate the difference quotient, $\frac{f(x+h) - f(x)}{h}$, for $f(x) = 2x^2 - 3$

Key:

1. a. $\frac{25y^4}{8x^3}$ b. $\frac{8}{x^{15}y^{18}}$

2. Degree is 10. The terms are: $5x^2y^2, -2x^4y^6, \text{ and } -9x^7y^2$

3. $2m^2 + 4mn - 3n^2$

4. $2x(x+3)(x^2-3x+9)$

5. $(x^2+9)(x+2)(x-2)$

6. $4(x+5)(x-2)(x+2)$

7. $(3x-2)(4x-1)$

8. $\frac{1}{x-2}$

9. $\frac{3(x+1)}{x(x+3)}$

10. $-\frac{x+y}{xy}$

11. $x = \frac{4}{3}$

12. $2x^2 \cdot |x| \cdot |2y-3|$

13. $17^{\frac{1}{20}}$

14. $x^{\frac{13}{20}}$

15. $\sqrt[3]{(a+b)^2}$

16. $1/9$

17. $\frac{\sqrt{6}}{4}$

18. $\frac{3\sqrt[5]{4x^3}}{x}$

19. $\frac{4\sqrt{2} + \sqrt{3}}{29}$

20. 0.56, $2/3$

21. 9×10^{13} disinteg/hour

22. 5×10^{-8}

23. 71.85 years

24. A. $D = \{-35, -25, 0, 10, 75\}$ b. $R = \{-55, -25, 25, 45, 50\}$ c. median = 0 d. mean = 8

25. A. $f(-1) = -2, f(a+2) = \frac{3a+1}{a+7}, f(-5)$ is undefined. B. Domain = $(-\infty, -5) \cup (-5, \infty)$

26. Not a function

27. A. $D = 200 - 40x$ b. 80 miles c. $m = -40$, indicates the distance to the station is decreasing at a rate of 40 miles per hour.

28. $f(x) = 0.06x + 6.50$

29. 14 30. $4x+2h$