Exit Ticket Sample Solutions

Write a note to a friend explaining how to use long division to find the quotient.

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

Set up the divisor outside the division symbol and the dividend underneath it. Then ask yourself what number multiplied by x is $2x^2$. Then multiply that number by $x + 1$, and record the results underneath $2x^2 - 3x$. Subtract these terms and bring down the -5. Then repeat the process.

Homework Problem Set Sample Solutions

Use the long division algorithm to determine the quotient in Problems 1–4.

1. $\dfrac{2x^3 - 13x^2 - x + 3}{2x + 1}$

$x^2 - 7x + 3$

2. $\dfrac{3x^3 + 4x^2 + 7x + 22}{x + 2}$

$3x^2 - 2x + 11$

3. $\dfrac{x^4 + 6x^3 - 7x^2 - 24x + 12}{x^2 - 4}$

$x^2 + 6x - 3$

4. $(12x^4 + 2x^3 + x - 3) \div (2x^2 + 1)$

$6x^2 + x - 3$

5. Use long division to find the polynomial, p, that satisfies the equation below. Hint: Solve for $p(x)$.

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

$p(x) = x^2 - 2$

6. Given $q(x) = 3x^3 - 4x^2 + 5x + k$.

A. Determine the value of k so that $3x - 7$ is a factor of the polynomial q.

$k = -28$

B. What is the quotient when you divide the polynomial q by $3x - 7$?

$x^2 + x + 4$

Use the long division algorithm to determine the quotient in Problems 7–10.

7. $\dfrac{x^2 - 9}{x + 3}$

$x - 3$

8. $\dfrac{x^4 - 81}{x + 3}$

$x^3 - 3x^2 + 9x - 27$

9. **What is similar about Problems 7 and 8?**

- Both have $x + 3$ in the denominator.
- The numerator in both is of the form $x^{\text{even integer}} - 3^{\text{even integer}}$.

10. $\dfrac{x^3 + 27}{x + 3}$

$x^2 - 3x + 9$

11. $\dfrac{x^5 + 243}{x + 3}$

$x^4 - 3x^3 + 9x^2 - 27x + 81$

12. What is similar about Problems 10 and 11?

- Both have $x + 3$ in the denominator.
- The numerator in both is of the form $x^{\text{odd integer}} + 3^{\text{odd integer}}$.

13. Look back on your answers in Problems 7 – 12 to help you answer the following questions.

A. Is $x + 3$ a factor of $x^3 - 27$? Explain your answer using the long division algorithm.

No. The remainder is not 0 when you perform long division.

B. Is $x + 3$ a factor of $x^2 + 9$? Explain your answer using the long division algorithm.

No. The remainder is not 0 when you perform long division.

C. For which positive integers n is $x + 3$ a factor of $x^n + 3^n$? Explain your reasoning.

Only if n is an odd number. By extending the patterns, we can generalize that $x + 3$ divides evenly into $x^n + 3^n$ for odd powers of n only.

D. If n is a positive integer, is $x + 3$ a factor of $x^n - 3^n$? Explain your reasoning.

Only for even numbers n. By extending the patterns, we can generalize that $x + 3$ will always divide evenly into the dividend.