



Problem 1 – Introduction

1. Identify the term that is associated with each of the parts of the division problem shown below.

$$\frac{x^2 + 9x + 14}{x + 7} = x + 2$$

a. \nearrow
b. \nearrow
c. \searrow

a. _____

b. _____

c. _____

To divide polynomials using your graphing calculator, enter the division problem and press **ENTER**. The result should either be a polynomial or a fraction. If the result is a polynomial, then the divisor is a factor of the dividend, so there is no remainder. If the result is a fraction, use the **Expand** command to expand the polynomial. If there are no fractional terms, then there is no remainder.

2. When $x^4 + 2x^3 - 13x^2 - 14x + 24$ is divided by $x - 1$, ...

a. the quotient is:

b. the remainder is:

3. Factor $x^4 + 2x^3 - 13x^2 - 14x + 24$, then divide by $x - 1$. How do your results explain the remainder obtained in the last question?

Problem 2 – Remainders

When dividing polynomials using your graphing calculator, sometimes the result will be a fraction. If this happens, you know there is a remainder. The Remainder Theorem is as follows:

A polynomial, $p(x)$, when divided by a linear factor $x - a$, where a is a number, results in a polynomial quotient, $q(x)$, and some remainder, r . Another way to state this is $p(x) = (x - a) \cdot q(x) + r$.

So, if $r = 0$, $x - a$ is a factor of $p(x)$.



Polly, Want Some Division?

Many cases of division result in remainders because divisors often do not divide evenly into the dividend. The following theorem and related problem address this situation. The absence of a remainder may also be used to determine if a divisor is a factor of a polynomial dividend.

Evaluating the polynomial at $x = a$ gives us:

$$\begin{aligned}p(a) &= (a - a) \cdot q(a) + r \\ &= (0) \cdot q(a) + r \\ &= 0 + r \\ &= r\end{aligned}$$

So, the value of the polynomial at $x = a$ is the remainder that results when the polynomial is divided by $x - a$. When $r = 0$, $x - a$ is a factor of the polynomial and a is a root or zero of the polynomial.

To find the quotient and the remainder with your graphing calculator, use the **Expand** command to expand the fraction. The numerator of the fractional term of the polynomial is the remainder.

4. When $x^3 - 7x - 6$ is divided by $x - 4$, ...

a. the quotient is:

b. the remainder is:

5. What is the value of $f(x) = x^3 - 7x - 6$ at $x = 4$? In other words, what is the value of $f(4)$?

$$f(4) =$$

6. 4 is a zero or root of the function $f(x) = x^3 - 7x - 6$.

agree

disagree

Problem 3 – Retained Impressions

7. Divide $6x^3 - 5x^2 + 4x - 17$ by $x - 3$.

a. The quotient is:

b. The remainder is:



Polly, Want Some Division?

8. Given $f(x) = 6x^3 - 5x^2 + 4x - 17$, what is the value of $f(3)$?

$$f(3) =$$

9. 3 is a zero or root of the function $f(x) = 6x^3 - 5x^2 + 4x - 17$.

agree

disagree

10. Divide $x^5 - 23x^3 + 6x^2 + 112x - 96$ by $x + 4$.

a. The quotient is:

b. The remainder is:

11. Given $f(x) = x^5 - 23x^3 + 6x^2 + 112x - 96$, what is the value of $f(-4)$?

$$f(-4) =$$

12. -4 is a zero or root of the function $f(x) = x^5 - 23x^3 + 6x^2 + 112x - 96$.

agree

disagree

In **y1**, enter $x^5 - 23x^3 + 6x^2 + 112x - 96$. In **y2**, enter **y1(x)/(x+4)**.

13. Describe the effect on the quotient as observed on the graph when a divisor is a factor of a dividend.