

3. Use long division to determine if $(x - 1)$ a factor of $(x^3 - 3x^2 - 13x + 15)$. Don't worry: the steps for the division process are below:

- Write the problem as long division.
- What do you have to multiply x by to get x^3 ? Write your answer above the bar.
- Multiply your answer from step b by $(x - 1)$ and write your answer below the dividend.
- Subtract. Be careful to subtract each term. (You might want to change the signs and add.)
- Repeat steps a-d until the expression that remains is less than $(x - 1)$.

$$\begin{array}{r}
 x^2 - 2x - 15 \\
 x-1 \overline{) x^3 - 3x^2 - 13x + 15} \\
 \underline{-x^3 + x^2} \\
 -2x^2 - 13x \\
 \underline{+2x^2 + 2x} \\
 -15x + 15 \\
 \underline{-15x + 15} \\
 0
 \end{array}
 \qquad
 \underline{(x-1)(x^2 - 2x - 15)}$$

We hope you survived the division process. Is $(x - 1)$ a factor of $(x^3 - 3x^2 - 13x + 15)$? yes

4. Try it again. Use long division to determine if $(2x + 3)$ is a factor of $2x^3 + 7x^2 + 2x + 9$. No hints this time. You can do it!

$$\begin{array}{r}
 x^2 + 2x - 2 + \frac{15}{2x+3} \\
 2x+3 \overline{) 2x^3 + 7x^2 + 2x + 9} \\
 \underline{-2x^3 + 6x^2} \\
 x^2 + 2x + 9 \\
 \underline{-x^2 - 2x - 6} \\
 15
 \end{array}$$

$$(2x+3) \left(x^2 + 2x - 2 + \frac{15}{2x+3} \right)$$

When dividing numbers, there were several ways to deal with the remainder. Sometimes, we just write it as the remainder, like this:

$$\begin{array}{r}
 8r.1 \\
 3 \overline{) 25}
 \end{array}
 \text{ because } 3(8) + 1 = 25$$

You may remember also writing the remainder as a fraction like this:

$$\begin{array}{r} 8 \frac{1}{3} \\ 3 \overline{) 25} \end{array} \text{ because } 3 \left(8 \frac{1}{3} \right) = 25$$

We do the same things with polynomials.

Maybe you found that $(2x^3 + 7x^2 + 2x + 9) \div (2x + 3) = (x^2 + 2x - 2) r. 15$. (We sure hope so.)
 You can use it to write two multiplication statements:

$$(2x + 3)(x^2 + 2x - 2) + 15 = (2x^3 + 7x^2 + 2x + 9)$$

and

$$(2x + 3)\left(x^2 + 2x - 2 + \frac{15}{2x + 3}\right) = (2x^3 + 7x^2 + 2x + 9)$$

5. Divide each of the following polynomials. Write the two multiplication statements that go with your answers if there is a remainder. Write only one multiplication statement if the divisor is a factor. Use graphing technology to check your work and make the necessary corrections.

	a) $(x^3 + 6x^2 + 13x + 12) \div (x + 3)$	b) $(x^3 - 4x^2 + 2x + 5) \div (x - 2)$
	$\begin{array}{r} r 3 \\ r 3/5 \\ \hline = x^2 + 3x + 4 \end{array}$	$\begin{array}{r} = x^2 - 2x - 2 + \frac{1}{x-2} \end{array}$
	$(x+3)(x^2+3x+4)$	$(x-2)(x^2-2x-2+\frac{1}{x-2})$
Multiplication statements:		

c) $(6x^3 - 11x^2 - 4x + 5) \div (2x - 1)$

d) $(x^4 - 23x^3 + 49x + 4) \div (x^2 + x + 2)$

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

$$x^2 - 24x + 22 + \frac{75x - 40}{x^2 + x + 2}$$

$$(2x-1)(3x^2-4x-4+\frac{1}{2x-1})$$

$$(x^2+x+2)(x^2-24x+22+\frac{75x-40}{x^2+x+2})$$

Multiplication statements:

READY

Topic: Solving equations

Solve for x.

1. $5x + 13 = 48$

2. $\frac{1}{3}x - 8 = 0$

3. $-4 - 9x = 0$

4. $x^2 - 16 = 0$

5. $x^2 + 4x + 3 = 0$

6. $x^2 - 5x + 6 = 0$

7. $(x + 8)(x + 11) = 0$

8. $(x - 5)(x - 7) = 0$

9. $(3x - 18)(5x - 10) = 0$

SET

Topic: Dividing polynomials

Divide each of the following polynomials. Write only one multiplication statement if the divisor is a factor. Write the two multiplication statements that go with your answers if there is a remainder.

10. $(x+1) \overline{)x^3 - 3x^2 + 6x + 11}$

11. $(x-5) \overline{)x^3 - 9x^2 + 23x - 15}$

$(x+1)(x^2 - 4x + 10 + \frac{1}{x+1})$

Multiplication statement(s)

$(x-5)(x^2 - 4x + 3)$

Multiplication statement(s)

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$$12. (2x-1) \overline{) \begin{array}{r} x^2 + 8x - 13 \\ 2x^3 + 15x^2 - 34x + 13 \end{array}}$$

$$13. (x+4) \overline{) \begin{array}{r} x^2 + 9x - 10 \\ x^3 + 13x^2 + 26x - 25 \end{array}} + \frac{15}{x+4}$$

Multiplication statement(s)

$$(2x-1)(x^2+8x-13)$$

Multiplication statement(s)

$$(x+4)(x^2+9x-10 + \frac{15}{x+4})$$

$$14. (x+7) \overline{) \begin{array}{r} x^2 - 15x - 6 \\ x^3 - 8x^2 - 11x + 10 \end{array}} + \frac{52}{x+7}$$

$$15. (3x-4) \overline{) \begin{array}{r} x^2 + 9x + 14 \\ 3x^3 + 23x^2 + 6x - 28 \end{array}} + \frac{28}{3x-4}$$

Multiplication statement(s)

$$(x+7)(x^2 - 15x - 6 + \frac{52}{x+7})$$

Multiplication statement(s)

$$(3x-4)(x^2 + 9x + 14 + \frac{28}{3x-4})$$

GO

Topic: Describing the features of different functions

Graph the following functions. Then identify the key features of the functions. Include domain, range, intervals where the function is increasing/decreasing, intercepts, maximum/minimum, and end behavior.

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