

Factoring polynomials — Easy

Name: _____

Date: _____

Factor each one. The number in front of x^2 is not 1.

1 $2x^2 - x - 1$

$$a \times c = 2 \times (-1) = -2$$

$$1 \times (-2) = -2, 1 + (-2) = -1$$

$$2x^2 + x - 2x - 1$$

$$x(2x + 1) - 1(2x + 1)$$

$$(2x + 1)(x - 1)$$

2 $3x^2 - 10x - 8$

3 $2x^2 - x - 10$

4 $2x^2 - 3x - 5$

5 $3x^2 - 3$

6 $2x^2 + 9x + 9$



Factoring polynomials — Easy

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Factor each one completely. Each has three factors.

1 $x^3 + 3x^2 - 4x - 12$

Try $x = \pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

$x = 2$ gives 0

$\div (x - 2) \rightarrow x^2 + 5x + 6$

$x^2 + 5x + 6$: $a \times c = 1 \times 6 = 6$

$2 \times 3 = 6, 2 + 3 = 5$

$x^2 + 2x + 3x + 6$

$x(x + 2) + 3(x + 2)$

$(x + 2)(x + 3)$

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

2 $x^3 + 6x^2 + 9x + 4$

3 $x^3 - 5x^2 + 7x - 3$

4 $x^3 + 8x^2 + 16x$

5 $x^3 - 3x^2 + 2x$

6 $x^3 - 5x^2 + 6x$

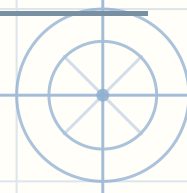


Dividing polynomials — Exact division

Name: _____

Date: _____

Divide each polynomial. Every one divides exactly, so every remainder is 0.



$$\begin{array}{r}
 \overline{) x^3 - x^2 - 14x + 8} \\
 \underline{-x^3 + 4x^2} \\
 3x^2 - 14x + 8 \\
 \underline{-3x^2 + 12x} \\
 -2x + 8 \\
 \underline{2x - 8} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{) x^3 - x^2 - 30x} \\
 \underline{-x^3 - 5x^2} \\
 -6x^2 - 30x \\
 \underline{6x^2 + 30x} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{) x^3 - 9x^2 + 15x + 25} \\
 \underline{-x^3 + 5x^2} \\
 -4x^2 + 15x + 25 \\
 \underline{4x^2 - 20x} \\
 -5x + 25 \\
 \underline{5x - 25} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{) x^3 - 2x^2 - 3x + 6} \\
 \underline{-x^3 + 2x^2} \\
 -3x + 6 \\
 \underline{3x - 6} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{) x^3 + 5x^2 + 8x + 16} \\
 \underline{-x^3 - 4x^2} \\
 x^2 + 8x + 16 \\
 \underline{-x^2 - 4x} \\
 4x + 16 \\
 \underline{-4x - 16} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{) x^3 + x^2 - 7x - 15} \\
 \underline{-x^3 + 3x^2} \\
 4x^2 - 7x - 15 \\
 \underline{-4x^2 + 12x} \\
 5x - 15 \\
 \underline{-5x + 15} \\
 0
 \end{array}$$

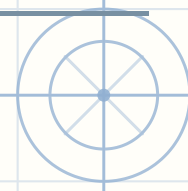


Dividing polynomials — With a remainder

Name: _____

Date: _____

Divide each polynomial. Every one leaves a remainder.



$$\begin{array}{r} x^2 + 5x + 6 \\ x + 2 \overline{) x^3 + 7x^2 + 16x + 8} \\ \underline{-x^3 - 2x^2} \\ 5x^2 + 16x + 8 \\ \underline{-5x^2 - 10x} \\ 6x + 8 \\ \underline{-6x - 12} \\ -4 \end{array}$$

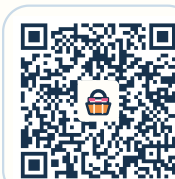
$$\begin{array}{r} x^2 + 2x + 4 \\ x - 3 \overline{) x^3 - x^2 - 2x - 3} \\ \underline{-x^3 + 3x^2} \\ 2x^2 - 2x - 3 \\ \underline{-2x^2 + 6x} \\ 4x - 3 \\ \underline{-4x + 12} \\ 9 \end{array}$$

$$\begin{array}{r} x^2 + x - 3 \\ x + 6 \overline{) x^3 + 7x^2 + 3x - 14} \\ \underline{-x^3 - 6x^2} \\ x^2 + 3x - 14 \\ \underline{-x^2 - 6x} \\ -3x - 14 \\ \underline{3x + 18} \\ 4 \end{array}$$

$$\begin{array}{r} x^2 - 2x + 2 \\ x + 4 \overline{) x^3 + 2x^2 - 6x + 7} \\ \underline{-x^3 - 4x^2} \\ -2x^2 - 6x + 7 \\ \underline{2x^2 + 8x} \\ 2x + 7 \\ \underline{-2x - 8} \\ -1 \end{array}$$

$$\begin{array}{r} x^2 - x + 3 \\ x - 5 \overline{) x^3 - 6x^2 + 8x - 19} \\ \underline{-x^3 + 5x^2} \\ -x^2 + 8x - 19 \\ \underline{x^2 - 5x} \\ 3x - 19 \\ \underline{-3x + 15} \\ -4 \end{array}$$

$$\begin{array}{r} x^2 + 4x + 5 \\ x - 3 \overline{) x^3 + x^2 - 7x - 16} \\ \underline{-x^3 + 3x^2} \\ 4x^2 - 7x - 16 \\ \underline{-4x^2 + 12x} \\ 5x - 16 \\ \underline{-5x + 15} \\ -1 \end{array}$$



Algebra 2 — Dividing polynomials

Name: _____

Date: _____

Divide each polynomial. The divisor has a number in front of x.

$$\begin{array}{r}
 \overline{4x^3 - 5x^2 - 15x + 4} \\
 \underline{-4x^3 + x^2} \\
 -4x^2 - 15x + 4 \\
 \underline{4x^2 - x} \\
 -16x + 4 \\
 \underline{16x - 4} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{4x^3 - 21x^2 - 42x - 20} \\
 \underline{-4x^3 - 3x^2} \\
 -24x^2 - 42x - 20 \\
 \underline{24x^2 + 18x} \\
 -24x - 20 \\
 \underline{24x + 18} \\
 -2
 \end{array}$$

$$\begin{array}{r}
 \overline{2x^3 - x^2 - 10x - 8} \\
 \underline{-2x^3 - 3x^2} \\
 -4x^2 - 10x - 8 \\
 \underline{4x^2 + 6x} \\
 -4x - 8 \\
 \underline{4x + 6} \\
 -2
 \end{array}$$

$$\begin{array}{r}
 \overline{4x^3 - 7x^2 - 15x} \\
 \underline{-4x^3 - 5x^2} \\
 -12x^2 - 15x \\
 \underline{12x^2 + 15x} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{3x^3 - 14x^2 + 4x + 3} \\
 \underline{-3x^3 - x^2} \\
 -15x^2 + 4x + 3 \\
 \underline{15x^2 + 5x} \\
 9x + 3 \\
 \underline{-9x - 3} \\
 0
 \end{array}$$

$$\begin{array}{r}
 \overline{3x^3 - 14x^2 + 11x - 2} \\
 \underline{-3x^3 + 2x^2} \\
 -12x^2 + 11x - 2 \\
 \underline{12x^2 - 8x} \\
 3x - 2 \\
 \underline{-3x + 2} \\
 0
 \end{array}$$



Power Pack · Factoring and dividing polynomials — Answer key

Factoring quadratics

1. $2x^2 - x - 1 = (2x + 1)(x - 1)$

2. $3x^2 - 10x - 8 = (3x + 2)(x - 4)$

3. $2x^2 - x - 10 = (x + 2)(2x - 5)$

4. $2x^2 - 3x - 5 = (x + 1)(2x - 5)$

5. $3x^2 - 3 = 3(x - 1)(x + 1)$

6. $2x^2 + 9x + 9 = (2x + 3)(x + 3)$

Factoring cubics

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

2. $x^3 + 6x^2 + 9x + 4 = (x + 1)^2(x + 4)$

3. $x^3 - 5x^2 + 7x - 3 = (x - 1)^2(x - 3)$

4. $x^3 + 8x^2 + 16x = x(x + 4)^2$

5. $x^3 - 3x^2 + 2x = x(x - 1)(x - 2)$

6. $x^3 - 5x^2 + 6x = x(x - 2)(x - 3)$

Dividing exactly

1. $(x^3 - x^2 - 14x + 8) \div (x - 4) = x^2 + 3x - 2$

2. $(x^3 - x^2 - 30x) \div (x + 5) = x^2 - 6x$

3. $(x^3 - 9x^2 + 15x + 25) \div (x - 5) = x^2 - 4x - 5$

4. $(x^3 - 2x^2 - 3x + 6) \div (x - 2) = x^2 - 3$

5. $(x^3 + 5x^2 + 8x + 16) \div (x + 4) = x^2 + x + 4$

6. $(x^3 + x^2 - 7x - 15) \div (x - 3) = x^2 + 4x + 5$

Dividing with a remainder

1. $(x^3 + 7x^2 + 16x + 8) \div (x + 2) = x^2 + 5x + 6$ remainder -4

2. $(x^3 - x^2 - 2x - 3) \div (x - 3) = x^2 + 2x + 4$ remainder 9

3. $(x^3 + 7x^2 + 3x - 14) \div (x + 6) = x^2 + x - 3$ remainder 4

4. $(x^3 + 2x^2 - 6x + 7) \div (x + 4) = x^2 - 2x + 2$ remainder -1

5. $(x^3 - 6x^2 + 8x - 19) \div (x - 5) = x^2 - x + 3$ remainder -4

6. $(x^3 + x^2 - 7x - 16) \div (x - 3) = x^2 + 4x + 5$ remainder -1

A number in front of x

1. $(4x^3 - 5x^2 - 15x + 4) \div (4x - 1) = x^2 - x - 4$

2. $(4x^3 - 21x^2 - 42x - 20) \div (4x + 3) = x^2 - 6x - 6$ remainder -2

3. $(2x^3 - x^2 - 10x - 8) \div (2x + 3) = x^2 - 2x - 2$ remainder -2

4. $(4x^3 - 7x^2 - 15x) \div (4x + 5) = x^2 - 3x$

5. $(3x^3 - 14x^2 + 4x + 3) \div (3x + 1) = x^2 - 5x + 3$

6. $(3x^3 - 14x^2 + 11x - 2) \div (3x - 2) = x^2 - 4x + 1$

