

# Precalculus - Polynomial Division and the Factor Theorem - Worksheet

Common Core A-APR.B.2, A-APR.D.6, A-APR.B.3 · [maths-pdf.fr/en/](https://maths-pdf.fr/en/)

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

These 20 problems practice dividing polynomials and using the Factor Theorem (Common Core A-APR.B.2, A-APR.D.6 and A-APR.B.3). You will use long and synthetic division, the Remainder Theorem and the Rational Root Theorem.

**Precalculus** · Common Core State Standards: **A-APR.B.2, A-APR.D.6, A-APR.B.3**

## Exercise 1 - Divide a quadratic

Divide  $x^2+7x+12$  by  $x+3$ .

## Exercise 2 - Long division, leading coefficient 2

Divide  $2x^2+5x-3$  by  $x+3$ .

## Exercise 3 - Remainder from long division

Divide  $x^3+2x^2-4x+7$  by  $x-1$ . Write the answer as quotient plus remainder over divisor.

## Exercise 4 - Synthetic division

Use synthetic division to divide  $x^3-4x^2+x+6$  by  $x-2$ .

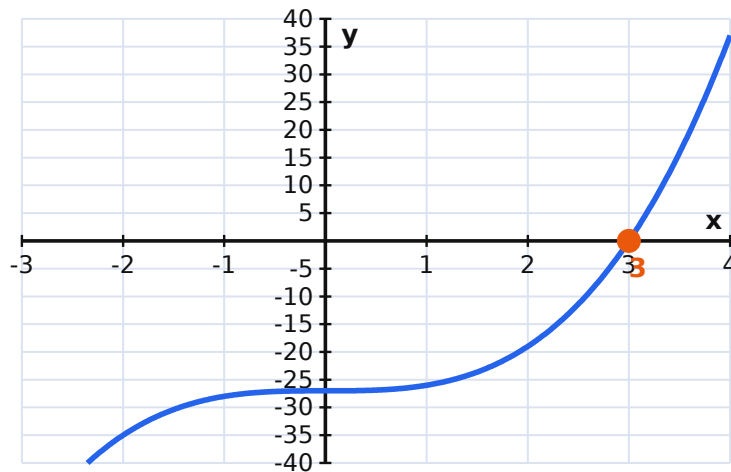
## Exercise 5 - Synthetic division with $c = -1$

Divide  $2x^3-3x^2+5x-1$  by  $x+1$  with synthetic division.

## Exercise 6 - Remainder Theorem

Find the remainder when  $f(x)=x^4-3x^2+5$  is divided by  $x-2$ , without dividing.

## Exercise 7 - Is it a factor?



Graph of  $x^3 - 27$ .

Is  $x-3$  a factor of  $x^3-27$ ? If so, factor completely over the integers.

### Exercise 8 - Test a factor

Is  $x+2$  a factor of  $x^3+3x^2-4x-12$ ?

### Exercise 9 - Find an unknown coefficient

Find  $k$  so that  $x-2$  is a factor of  $x^3+kx^2-4x-4$ .

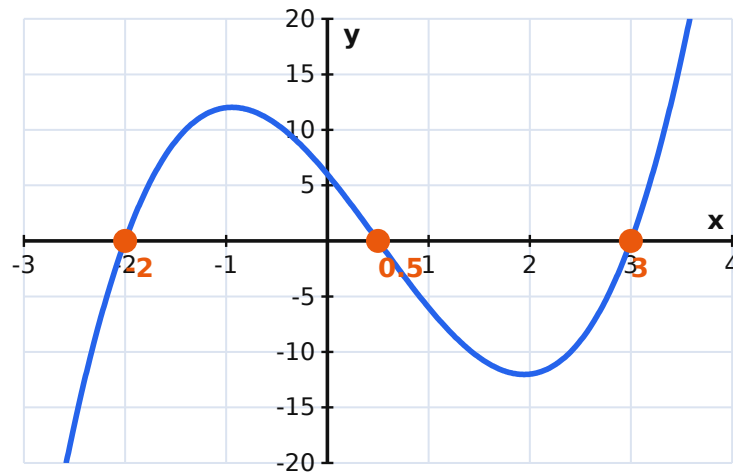
### Exercise 10 - Factor completely

Given that  $x=1$  is a zero, factor  $x^3-7x+6$  completely.

### Exercise 11 - Rational root candidates

List all possible rational zeros of  $2x^3-3x^2-11x+6$ .

### Exercise 12 - Find all zeros



Graph of  $f$ .

Find all zeros of  $f(x) = 2x^3 - 3x^2 - 11x + 6$ .

### Exercise 13 - Missing terms

Divide  $x^3 - 8$  by  $x - 2$  using synthetic division. Remember the missing terms.

### Exercise 14 - Biquadratic

Solve  $x^4 - 5x^2 + 4 = 0$ .

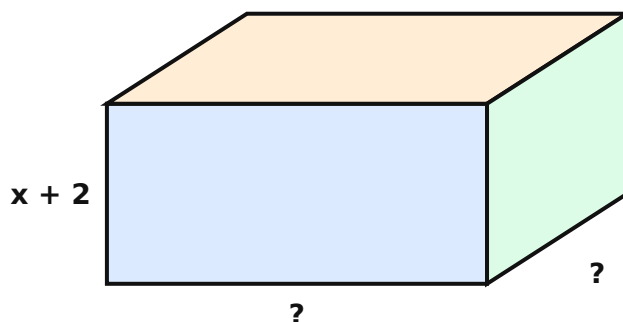
### Exercise 15 - Quartic zeros

Find all zeros of  $x^4 - x^3 - 7x^2 + x + 6$ , given that 1 and  $-1$  are zeros.

### Exercise 16 - Divide by a non-monic linear divisor

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

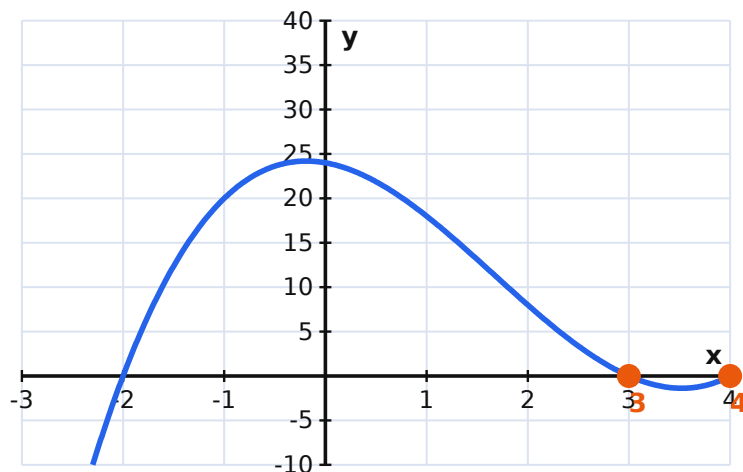
### Exercise 17 - Box dimensions



$$\text{Volume } V = x^3 + 9x^2 + 26x + 24.$$

A storage box has volume  $V(x) = x^3 + 9x^2 + 26x + 24$  cubic feet and height  $x + 2$  feet. Find expressions for the other two dimensions.

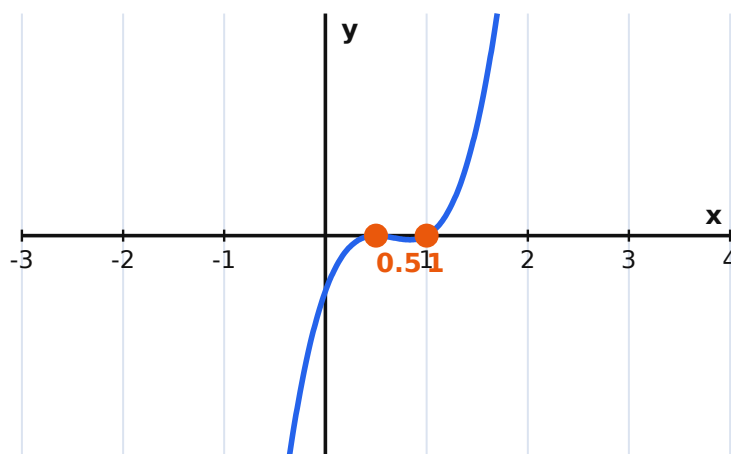
### Exercise 18 - Break-even years



Profit model for Liam's food truck.

The profit of Liam's food truck, in thousands of dollars, is  $P(t) = t^3 - 5t^2 - 2t + 24$  after  $t$  years. Show that  $P(4) = 0$ , then find every  $t \geq 0$  at which the profit is 0.

### Exercise 19 - Multiplicity of a zero



Graph of  $f$ .

Show that  $x = \frac{1}{2}$  is a zero of  $4x^3 - 8x^2 + 5x - 1$ , then find all zeros and the multiplicity of each.

### Exercise 20 - Polynomial with integer coefficients

Write a cubic with integer coefficients that has zeros 2,  $-\frac{1}{2}$  and 3 and leading coefficient 2.