

Algebra 2 · Polynomial Division and the Remainder Theorem · Quiz

Common Core A-APR.B.2, A-APR.D.6, A-APR.C.4 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

Answer these 10 multiple-choice questions on polynomial division, the Remainder Theorem, the Factor Theorem, and polynomial identities. Each question has exactly one correct answer, and the explanation after each answer shows the key step.

Algebra 2 Common Core: **A-APR.B.2 · A-APR.D.6 · A-APR.C.4**

Questions

Question 1

The table shows synthetic division of $x^3 - 4x^2 + 3x - 5$ by $x - 2$. What is the remainder?

2	1	-4	3	-5
		2	-4	-2
	1	-2	-1	-7
	quotient coefficients			remainder

Synthetic division of $x^3 - 4x^2 + 3x - 5$ by $x - 2$.

- A. 7
- B. -1
- C. -7
- D. -5

Question 2

What is the remainder when $x^3 - 2x^2 + x - 5$ is divided by $x - 3$?

- A. -53
- B. 7
- C. -5

D. -3

Question 3

What is the quotient when x^2+x-12 is divided by $x-3$?

- A. $x-4$
- B. $x+3$
- C. $x-3$
- D. $x+4$

Question 4

If $p(5)=0$ for a polynomial $p(x)$, which statement must be true?

- A. $x+5$ is a factor of $p(x)$
- B. $p(x)$ has y-intercept 5
- C. $p(0)=5$
- D. $x-5$ is a factor of $p(x)$

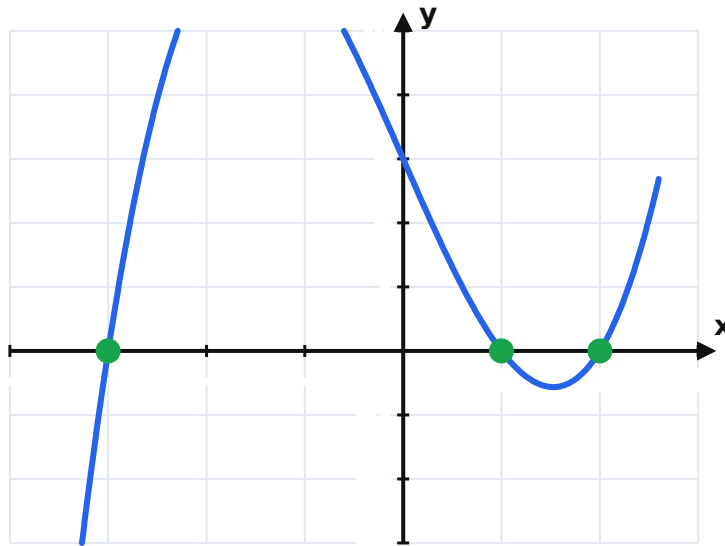
Question 5

A polynomial of degree 5 is divided by a polynomial of degree 2. What is the degree of the quotient?

- A. 2
- B. 3
- C. 5
- D. 7

Question 6

The graph of a cubic polynomial f crosses the x-axis at -3 , 1 , and 2 . Which is a factor of $f(x)$?

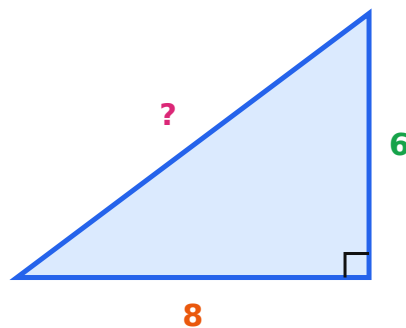


A cubic with zeros at -3 , 1 , and 2 .

- A. $x+3$
- B. $x-3$
- C. $x+1$
- D. $x+2$

Question 7

A right triangle has legs $2xy$ and x^2-y^2 . For $x=3$ and $y=1$ the legs are 6 and 8. Which expression gives the hypotenuse, and what is its length?



A right triangle from $x=3$, $y=1$: legs $2xy=6$ and $x^2-y^2=8$.

- A. $x^2-y^2=8$
- B. $x^2+y^2=10$
- C. $2xy=6$
- D. $(x+y)^2=16$

Question 8

What is the remainder when x^3+1 is divided by $x+1$?

- A. 0
- B. 1
- C. 2
- D. -1

Question 9

What is $(x^3-8)\div(x-2)$?

- A. x^2-2x+4
- B. x^2+4
- C. x^2+2x+4
- D. x^2+2x-4

Question 10

Which expression is equal to $(x^2-y^2)^2+(2xy)^2$ for all x and y ?

- A. x^4+y^4
- B. $(x^2-y^2+2xy)^2$
- C. $(x^2+y^2)^2$
- D. $(x+y)^4$

Answer key

1. **C** - The last number in the bottom row is the remainder, -7 . It equals $p(2) = 8 - 16 + 6 - 5 = -7$. The numbers $1, -2, -1$ are the quotient coefficients.
2. **B** - By the Remainder Theorem the remainder is $p(3) = 27 - 18 + 3 - 5 = 7$. Using $x = -3$ by mistake gives -53 .
3. **D** - Since $3^2 + 3 - 12 = 0$, the division is exact: $(x-3)(x+4) = x^2 + x - 12$. Dropping the sign of 4 gives $x-4$.
4. **D** - The Factor Theorem says $x-c$ is a factor exactly when $p(c) = 0$. With $c = 5$ the factor is $x-5$, not $x+5$.
5. **B** - Degrees subtract when you divide: $5-2=3$. Adding the degrees (7) is the multiplication rule.
6. **A** - A zero at $x = -3$ means $f(-3) = 0$, so $x - (-3) = x+3$ is a factor. The sign of the factor is opposite to the sign of the zero.
7. **B** - The identity $(x^2+y^2)^2 = (x^2-y^2)^2 + (2xy)^2$ shows the hypotenuse is $x^2+y^2 = 9+1 = 10$. Check: $6^2+8^2 = 100 = 10^2$.
8. **A** - The remainder is $p(-1) = -1+1 = 0$. Evaluating at $x = 1$ gives 2 , which is the wrong sign for c .
9. **C** - Check by multiplying: $(x-2)(x^2+2x+4) = x^3+2x^2+4x-2x^2-4x-8 = x^3-8$. The two middle terms cancel.
10. **C** - Expanding gives $x^4 - 2x^2y^2 + y^4 + 4x^2y^2 = x^4 + 2x^2y^2 + y^4 = (x^2+y^2)^2$. The middle term does not vanish, so x^4+y^4 is wrong.

Remember:

- Standards A-APR.B.2, A-APR.D.6, and A-APR.C.4: remainders, division of polynomials, and polynomial identities.
- Division statement: $p(x) = d(x)q(x) + r(x)$ where the remainder has smaller degree than the divisor.
- Remainder Theorem: dividing $p(x)$ by $x-c$ leaves remainder $p(c)$.
- Factor Theorem: $x-c$ is a factor of $p(x)$ if and only if $p(c) = 0$.
- Identity: $(x^2+y^2)^2 = (x^2-y^2)^2 + (2xy)^2$ generates Pythagorean triples.