LESSON MAKER PRO

Find the Zeros

Factor a polynomial to find when its value is zero.

HIGH SCHOOL · A2S.AF.A.6

A2S.AF.A.6 "Factor polynomials using common factoring techniques, and use the factored form of a polynomial to reveal the zeros of the function it defines."

NAME _____ DATE _____

FACTOR, THEN SOLVE

To find the zeros of a polynomial, factor it into a product and set the product equal to zero. Then set each factor equal to zero and solve. A number is a zero when it makes the polynomial equal zero.

WORKED EXAMPLE

Factor $f(x) = x^2 - 13x + 36$, then find its zeros.

1. Find two numbers that multiply to 36 and add to -13: -4 and -9.
2. Rewrite: $f(x) = x^2 - 4x - 9x + 36$.
3. Factor: $f(x) = (x - 4)(x - 9)$.
4. Set each factor equal to zero: $x - 4 = 0$ or $x - 9 = 0$.

Answer: f(x) = (x - 4)(x - 9); zeros: 4 and 9.

PRACTICE 6 problems

1 Factor $f(x) = x^2 - 7x + 10$. List its zeros.

ANSWER _____

2 Factor $f(x) = 6x^2 + 18x$. List its zeros.

ANSWER _____

3 Factor $f(x) = x^2 - 49$. List its zeros.

ANSWER _____

4 Factor $f(x) = x^2 + 8x + 15$. List its zeros.

ANSWER _____

5 Factor $f(x) = 3x^2 - 21x + 30$ completely. List its zeros.

ANSWER _____

6 Factor $f(x) = 2x^2 + 7x + 5$. List its zeros.

ANSWER _____

APPLY IT Show your work

1 At a school field day, a student tosses a ball straight up from the ground. Its height in meters after x seconds is $h(x) = -5x^2 + 30x$. Factor h(x), then find when the ball is on the ground.

WORK SPACE

ANSWER _____

2 A club sells shirts to raise money. Its profit in dollars is $P(x) = -20x^2 + 140x - 200$, where x is the number of ten-shirt batches sold. Factor P(x). How many shirts must the club sell to break even?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Factor $f(x) = 5x^3 - 125x$ completely. List all its zeros, and explain why $x = 0$ must be included.

WORK SPACE AND ANSWER

ANSWER KEY

Find the Zeros

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Factor $f(x) = x^2 - 7x + 10$. List its zeros.	**f(x) = (x - 2)(x - 5); zeros: 2 and 5.**
2	Factor $f(x) = 6x^2 + 18x$. List its zeros.	**f(x) = 6x(x + 3); zeros: 0 and -3.**
3	Factor $f(x) = x^2 - 49$. List its zeros.	**f(x) = (x - 7)(x + 7); zeros: 7 and -7.**
4	Factor $f(x) = x^2 + 8x + 15$. List its zeros.	**f(x) = (x + 3)(x + 5); zeros: -3 and -5.**
5	Factor $f(x) = 3x^2 - 21x + 30$ completely. List its zeros.	**f(x) = 3(x - 5)(x - 2); zeros: 5 and 2.**
6	Factor $f(x) = 2x^2 + 7x + 5$. List its zeros.	**f(x) = (2x + 5)(x + 1); zeros: -5/2 and -1.**

PART 2 · APPLY IT

1. **h(x) = -5x(x - 6); the ball is on the ground at 0 seconds and 6 seconds.** Factor out -5x. Set each factor equal to zero to get x = 0 and x = 6.
2. **P(x) = -20(x - 2)(x - 5); the club breaks even after selling 20 shirts or 50 shirts.** Factor out -20, then factor $x^2 - 7x + 10$. Zero profit occurs at x = 2 or x = 5 ten-shirt batches.

CHALLENGE

f(x) = 5x(x - 5)(x + 5); zeros: 0, 5, and -5. The factor x equals zero when x = 0, so the whole product equals zero.

Accept factors in either order and zeros in any order. Equivalent factored forms are acceptable when every factor is fully factored.