LESSON MAKER PRO

Find the Zeros

Use factors to find where a polynomial equals zero.

HIGH SCHOOL · MT.PLUS.ALG.POLY.2.c

MT.PLUS.ALG.POLY.2.c "Understand that polynomial expressions can be represented in both factored and standard form, and the specific features of each form by: Interpreting the relationship between the factored form of the expression and the zeros of the..."

NAME _____ DATE _____

FACTORS REVEAL ZEROS

Factored form writes a polynomial as a product. To find its zeros, set each factor equal to 0 and solve for x. A nonzero number multiplying the factors does not change the zeros, and a repeated factor gives a repeated zero.

WORKED EXAMPLE

Find the zeros of $f(x) = 7(x + 11)(x - 13)$.

1. Set each factor equal to 0: $x + 11 = 0$ or $x - 13 = 0$.
2. Solve: $x = -11$ or $x = 13$.

Answer: The zeros are -11 and 13.

PRACTICE 6 problems

1 Find the zeros of $f(x) = (x - 4)(x + 2)$.

ANSWER _____

2 Find the zeros of $f(x) = -2x(x - 9)$.

ANSWER _____

3 Find the zero of $f(x) = 5(x + 6)^2$ and state its multiplicity.

ANSWER _____

4 Find the zeros of $f(x) = (2x - 3)(x + 5)$.

ANSWER _____

5 Factor $f(x) = x^2 - 8x + 15$, then find its zeros.

ANSWER _____

6 Find all the zeros of $f(x) = -(x + 1)(x - 1)(x - 8)$.

ANSWER _____

APPLY IT Show your work

1 A student tosses a foam ball straight up from ground level. Its height in feet after t seconds is $h(t) = -16t(t - 2)$, for $0 \le t \le 2$. At what two times is the ball on the ground? What does each time mean?

WORK SPACE

ANSWER _____

2 A pop-up sneaker booth models its profit in dollars after selling x pairs as $P(x) = -2(x - 20)(x - 60)$, for $0 \le x \le 60$. How many pairs must it sell to break even? Explain what both zeros mean in this setting.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let $f(x) = (x - 2)^2(x + 4)$ and $g(x) = (x - 2)(x + 4)^2$. Do the functions have the same zeros? In two sentences, explain how their graphs behave differently at $x = 2$.

WORK SPACE AND ANSWER

ANSWER KEY # Find the Zeros

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the zeros of $f(x) = (x - 4)(x + 2)$.	**-2 and 4**
2	Find the zeros of $f(x) = -2x(x - 9)$.	**0 and 9**
3	Find the zero of $f(x) = 5(x + 6)^2$ and state its multiplicity.	**The zero is -6, with multiplicity 2.**
4	Find the zeros of $f(x) = (2x - 3)(x + 5)$.	**-5 and 3/2**
5	Factor $f(x) = x^2 - 8x + 15$, then find its zeros.	**f(x) = (x - 3)(x - 5); the zeros are 3 and 5.**
6	Find all the zeros of $f(x) = -(x + 1)(x - 1)(x - 8)$.	**-1, 1, and 8**

PART 2 · APPLY IT

1. **The ball is on the ground at 0 seconds, when it is tossed, and at 2 seconds, when it lands.** Set each factor equal to 0 to get $t = 0$ and $t = 2$. Both times are in the given time interval.
2. **The booth breaks even after selling 20 pairs or 60 pairs. At either number of pairs, its profit is $0.** Set each factor equal to 0 to get $x = 20$ and $x = 60$. Both are possible sales amounts in the given range.

CHALLENGE

Both functions have zeros at x = 2 and x = -4. At x = 2, the graph of f touches the x-axis, while the graph of g crosses it, because 2 is a repeated zero of f but not of g.

Accept zeros in any order. For the challenge, accept equivalent wording that distinguishes touching from crossing at $x = 2$.