LESSON MAKER PRO

Forms Reveal More

Rewrite a function to spotlight its features.

HIGH SCHOOL · HSF-IF.C.8

CCSS.Math.Content.HSF-IF.C.8 "Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function."

NAME _____ DATE _____

CHOOSE THE USEFUL FORM

Use factored form to find zeros, vertex form to find a maximum or minimum, and standard form to find the y-intercept. Equivalent forms have the same outputs, but each form makes a different feature easier to see.

WORKED EXAMPLE

Write $q(x) = x^2 + 13x + 40$ in factored form. Then find its zeros.

1. Find two numbers with product 40 and sum 13.
2. The numbers are 5 and 8.
3. $q(x) = (x + 5)(x + 8)$.
4. Set each factor equal to 0: $x = -5$ or $x = -8$.

Answer: q(x) = (x + 5)(x + 8); zeros: -5, -8

PRACTICE 5 problems

1 Write $f(x) = x^2 + 7x + 12$ in factored form. State the zeros.

ANSWER _____

2 Expand $g(x) = (x - 6)^2 - 9$. State the vertex.

ANSWER _____

3 Factor $h(x) = 3x^2 - 27$ completely. State the zeros.

ANSWER _____

4 Write $r(x) = x^2 - 2x - 15$ in vertex form. State the vertex.

ANSWER _____

5 Expand $s(x) = (x + 2)(x - 11)$. State the y-intercept.

ANSWER _____

APPLY IT Show your work

1 A game designer models a character's jump height by $h(t) = -t^2 + 12t + 28$. Write h in vertex form. What is the greatest height, and when does it occur?

WORK SPACE

ANSWER _____

2 A student-run sticker shop models profit by $P(b) = -b^2 + 7b + 18$, where b is the number of batches sold. Write P in factored form. At what nonnegative number of batches does the shop break even?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A quadratic f has zeros 2 and 10, and $f(6) = -32$. Write f in factored form and vertex form. Explain how you found the leading coefficient.

WORK SPACE AND ANSWER

Forms Reveal More

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write $f(x) = x^2 + 7x + 12$ in factored form. State the zeros.	**$f(x) = (x + 3)(x + 4)$; zeros: -3, -4**
2	Expand $g(x) = (x - 6)^2 - 9$. State the vertex.	**$g(x) = x^2 - 12x + 27$; vertex: (6, -9)**
3	Factor $h(x) = 3x^2 - 27$ completely. State the zeros.	**$h(x) = 3(x - 3)(x + 3)$; zeros: 3, -3**
4	Write $r(x) = x^2 - 2x - 15$ in vertex form. State the vertex.	**$r(x) = (x - 1)^2 - 16$; vertex: (1, -16)**
5	Expand $s(x) = (x + 2)(x - 11)$. State the y-intercept.	**$s(x) = x^2 - 9x - 22$; y-intercept: (0, -22)**

PART 2 · APPLY IT

1. **$h(t) = -(t - 6)^2 + 64$; greatest height: 64 at $t = 6$** Complete the square to write the function in vertex form. The vertex gives the greatest height because the leading coefficient is negative.
2. **$P(b) = -(b - 9)(b + 2)$; break-even: $b = 9$** Factor out negative 1, then factor the quadratic. The zeros are 9 and -2, but only 9 is a nonnegative number of batches.

CHALLENGE

$f(x) = 2(x - 2)(x - 10) = 2(x - 6)^2 - 32$. Since $f(6) = a(6 - 2)(6 - 10) = -16a = -32$, $a = 2$.

Accept equivalent factored or vertex forms with factors or terms in a different order. For contextual questions, accept the stated feature only when it is interpreted within the given domain.