Factored Form → Vertex Form

Convert between quadratic forms and explain what each representation reveals.

For each quadratic function:

a) Identify its zeros and predict the axis of symmetry using their midpoint.
b) Expand and simplify into general form; identify the y-intercept.
c) Complete the square, then identify the vertex.
d) Sketch the function.

Mild — Monic quadratics
Expand and complete the square with a = 1.

1. $y = (x - 1)(x - 3)$

2. $y = (x + 2)(x - 4)$

3. $y = (x + 1)(x + 5)$

4. $y = (x - 2)(x + 6)$

Medium — Leading coefficients
Include coefficients other than 1, including negative values.

5. $y = 2(x - 1)(x - 3)$

6. $y = 3(x + 1)(x - 3)$

7. $y = -(x - 2)(x - 8)$

8. $y = -2(x + 2)(x - 4)$

Spicy — Exact fractional values
Keep vertex coordinates exact. Use fractions, not decimal approximations.

9. $y = (x - 1)(x - 4)$

10. $y = 2(x - 2)(x - 5)$

11. $y = -(x + 1)(x - 4)$

12. $y = -2(x + 3)(x - 2)$

Extra Spicy — Mixed coefficients and fractional vertices
Expand carefully, then complete the square. Keep all values exact.

13. $y = 3(x - 2)(x + 5)$

14. $y = -3(x - 4)(x + 1)$

15. $y = (2x - 3)(x + 4)$

16. $y = -2(2x + 1)(x - 3)$

Making connections

17. Compare 1 and 5. What stays the same when a changes? What changes?

18. Compare 2 and 8. Why do their axes and zeros agree, but their vertices differ?

19. Why must the midpoint of the zeros equal the p-value in vertex form?