

Vertex Form and Intercept Form Worksheet

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Quick Reference

VERTEX FORM

$$y = a(x - h)^2 + k$$

The vertex is (h, k), read directly from the equation. Remember the built-in minus sign flips h — $y = (x + 3)^2$ has vertex $x = -3$, not 3.

INTERCEPT FORM

$$y = a(x - p)(x - q)$$

The x-intercepts are p and q, with the same sign flip. The vertex sits at the midpoint of p and q.

Worked Examples

Standard form → vertex form: $y = x^2 - 6x + 5$

Half of -6 is -3 , squared is 9. Add and subtract 9: $y = (x^2 - 6x + 9) - 9 + 5$. The first three terms form $(x - 3)^2$, leaving **$y = (x - 3)^2 - 4$, vertex (3, -4)**.

Standard form → intercept form: $y = x^2 - 2x - 3$

Two numbers that multiply to -3 and add to -2 : -3 and 1. Factors to **$y = (x - 3)(x + 1)$, roots $x = 3$ and $x = -1$, vertex (1, -4)**. Watch the sign — the factor $(x + 1)$ gives root -1 , not $+1$.

Part A — Write in Intercept Form, Then Give the Roots and Vertex

Factor each quadratic into intercept form, then state the two x-intercepts and the vertex.

1. $y = x^2 - 4x - 5$

Intercept form: _____ Roots: _____ Vertex: _____

2. $y = x^2 + 4x + 3$

Intercept form: _____ Roots: _____ Vertex: _____

3. $y = x^2 - 6x + 8$

Intercept form: _____ Roots: _____ Vertex: _____

4. $y = x^2 + 2x - 15$

Intercept form: _____ Roots: _____ Vertex: _____

5. $y = x^2 - 8x + 12$

Intercept form: _____ Roots: _____ Vertex: _____

6. $y = x^2 + 6x + 5$

Intercept form: _____ Roots: _____ Vertex: _____

7. $y = x^2 - 2x - 8$

Intercept form: _____ Roots: _____ Vertex: _____

8. $y = x^2 - 9$

Intercept form: _____ Roots: _____ Vertex: _____

9. $y = 2x^2 - 4x - 6$

Intercept form: _____ Roots: _____ Vertex: _____

10. $y = x^2 - 5x + 6$

Intercept form: _____ Roots: _____ Vertex: _____

Part B — Write in Vertex Form by Completing the Square, Then Give the Vertex

Complete the square to rewrite each quadratic in vertex form, then state the vertex.

11. $y = x^2 - 4x + 1$

Vertex form: _____ Vertex: _____

12. $y = x^2 + 6x + 5$

Vertex form: _____ Vertex: _____

13. $y = x^2 - 2x - 8$

Vertex form: _____ Vertex: _____

14. $y = x^2 + 8x + 10$

Vertex form: _____ Vertex: _____

15. $y = x^2 - 10x + 21$

Vertex form: _____ Vertex: _____

16. $y = x^2 + 2x - 5$

Vertex form: _____ Vertex: _____

17. $y = x^2 - 6x + 4$

Vertex form: _____ Vertex: _____

18. $y = x^2 + 4x + 9$

Vertex form: _____ Vertex: _____

19. $y = 2x^2 - 8x + 3$

Vertex form: _____ Vertex: _____

20. $y = x^2 - 12x + 40$

Vertex form: _____ Vertex: _____

Answer Key

Part A — Intercept Form

#	INTERCEPT FORM	ROOTS	VERTEX
1	$y = (x - 5)(x + 1)$	5, -1	(2, -9)
2	$y = (x + 1)(x + 3)$	-1, -3	(-2, -1)
3	$y = (x - 2)(x - 4)$	2, 4	(3, -1)
4	$y = (x + 5)(x - 3)$	-5, 3	(-1, -16)
5	$y = (x - 2)(x - 6)$	2, 6	(4, -4)
6	$y = (x + 1)(x + 5)$	-1, -5	(-3, -4)
7	$y = (x - 4)(x + 2)$	4, -2	(1, -9)
8	$y = (x - 3)(x + 3)$	3, -3	(0, -9)
9	$y = 2(x - 3)(x + 1)$	3, -1	(1, -8)
10	$y = (x - 2)(x - 3)$	2, 3	(5/2, -1/4)

Part B — Vertex Form

#	VERTEX FORM	VERTEX
11	$y = (x - 2)^2 - 3$	(2, -3)
12	$y = (x + 3)^2 - 4$	(-3, -4)
13	$y = (x - 1)^2 - 9$	(1, -9)
14	$y = (x + 4)^2 - 6$	(-4, -6)
15	$y = (x - 5)^2 - 4$	(5, -4)
16	$y = (x + 1)^2 - 6$	(-1, -6)
17	$y = (x - 3)^2 - 5$	(3, -5)
18	$y = (x + 2)^2 + 5$	(-2, 5)
19	$y = 2(x - 2)^2 - 5$	(2, -5)
20	$y = (x - 6)^2 + 4$	(6, 4)