Graphing Quadratic Functions in General Form

Instructions:

a. Identify a, b, and c.
b. Calculate the y-intercept: $x = 0$.
c. Calculate the axis of symmetry: $x = \frac{-b}{2a}$.
d. Calculate the vertex: $f\left(\frac{-b}{2a}\right)$
e. Identify if the parabola has a maximum or minimum and what it is.
f. Sketch the function.

MILD

1. $y = 2x^2 - 4x + 1$
2. $y = 2x^2 + 4x - 3$
3. $y = 2x^2 - 8x + 6$
4. $y = -x^2 + 6x - 2$

MEDIUM

5. $y = -2x^2 + 8x - 3$
6. $y = 3x^2 - 12x + 5$
7. $y = -3x^2 - 12x - 8$
8. $y = \frac{1}{2}x^2 - 3x + 4$
9. $y = -\frac{3}{2}x^2 + 9x - 1$

SPICY

10. $y = 2x^2 - 2x - 1$
11. $y = 2x^2 - 3x - 1$
12. $y = -\frac{3}{2}x^2 - 4x + 1$
13. $y = -2x^2 + 5x + 1$

14. Consider $y = 2x^2 - 5x + 1$. Compare it with the function in Question 13.
    a. Before calculating, predict whether they share an axis of symmetry and y-intercept.
    b. Predict how their opening directions and vertices compare.
    c. Sketch both on the same coordinate plane.
    d. Explain how the parabolas are related. What role does the line y = 1 play?

EXTRA SPICY

15. $y = \frac{3}{2}x^2 - 2x - \frac{1}{2}$

16. Before sketching, compare $y = \frac{3}{2}x^2 - 2x + \frac{5}{2}$ with Question 15:
    a. Predict which characteristics will remain unchanged.
    b. Predict how the y-intercept, vertex, and range will change.
    c. Sketch both parabolas on the same coordinate plane.

17. Compare $y = -\frac{3}{4}x^2 + \frac{5}{2}x - \frac{1}{2}$ and $y = \frac{3}{4}x^2 + \frac{5}{2}x + \frac{1}{2}$.
    a. Sketch both on the same coordinate plane.
    b. How are their opening directions related?
    c. How are their axes of symmetry related?
    d. How are their vertices and y-intercepts related?

18. A quadratic has $a = -\frac{3}{2}$, a y-intercept of $(0,1)$, and an axis of symmetry of $x = \frac{4}{3}$.
    a. Determine b and c.
    b. Write the function in general form.
    c. Calculate the vertex.
    d. State the maximum or minimum and range.
    e. Sketch the parabola, identifying at least two pairs of symmetric points.