Finding the Vertex of Quadratic Equations

The vertex \((x, y)\) of equations in the form \(y = ax^2 + bx + c\) can be found by letting \(x = -\frac{b}{2a}\), and \(y\) will be whatever you get when you plug \(x\) into the equation above.

- Example: \(y = 3x^2 + 12x – 5\) For the vertex, \(x = -\frac{b}{2a} = -\frac{12}{2(3)} = -\frac{12}{6} = -2\).

Plug in \(x = -2\) into the equation:
\[
y = 3(-2)^2 + 12(-2) – 5 = 3(4) – 24 – 5 = 12 – 29 = -17
\]

So, the vertex is \((-2, -17)\).

Find the vertex of the parabolas given by the equations below.

1. \(y = 3x^2 - 24x - 7\)  
2. \(y = x^2 + 6x + 3\)  
3. \(y = -2x^2 - 8x + 10\)  
4. \(y = 2x^2 - 16x + 1\)  
5. \(y = 3x^2 - 24x - 15\)  
6. \(y = -x^2 + 5x + 1\)  
7. \(y = -4x^2 + 8x – 1\)  
8. \(y = 6x^2 + 12x + 6\)  
9. \(y = 2x^2 - 2x + 5\)