Challenging Quadratic Functions Problems

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1. For which values of b will the quadratic function $f(x) = x^2 - 2bx + 7$ have a minimum value of 6?

2. For which values of c will it be possible for the quadratic function $f(x) = x^2 - 2bx + c$ to have a minimum value of 6?

3. Suppose the quadratic function $f(x) = ax^2 + bx + c$ with $f(-2) = 0$ and $-\dfrac{b}{2a} = 1$. Solve $f(x) = 0$.

4. Find the formula for a quadratic function $y = f(x)$ with vertex $(-1, 5)$ and the point $(-2, 3)$ on its graph.

5. Find the formula for a quadratic function $y = f(x)$ with x-intercepts $(-1, 0)$ and $(5, 0)$ and y-intercept $(0, 10)$.

6. Does **every** quadratic function $f(x) = ax^2 + bx + c$ have x-intercepts? If yes, prove it. If not, find conditions on the coefficients a, b and c that guarantee the presence of x-intercepts.