Quadratics.

1. Let \( y = x^2 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is _____.

2. Let \( y = (x - 2)^2 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is _____.

3. Let \( y = (x - 2)^2 + 5 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is _____.

4. Let \( y = x^2 - 4x + 9 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is _____.

   Hint: convince yourself, by multiplication, that the equation in number 3 is exactly the same as the equation in number 4. Therefore the answer is obvious.

5. Let \( y = x^2 + 6x - 1 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is _____.

   Hint: rewrite the equation so that it looks like the ones in 1 through 3. Start by noting that \((x + 3)^2 = x^2 + 6x + 9\) and make the proper adjustment by subtracting 10 so that the equations are the same.

6. Let \( y = x^2 - 8x + 5 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is _____.
7. Let \( y = 2x^2 + 8x + 1 \). The smallest value that \( y \) can take on is _____, which it takes if \( x \) is ______. Hint: The leading coefficient is 2, which is somewhat annoying. So factor as \( y = 2\left(x^2 + 4x\right) + 1 \) and proceed as before, or else divide everything by 2 since \( y \) will be the smallest when \( \frac{y}{2} \) is.

8. Let \( y = -x^2 + 4x + 1 \). Does \( y \) have a minimum value, or a maximum?_______
9. Find it, and the value of \( x \) that produces it.

10. Let \( y = ax^2 + bx + c \). \( y \) will have a minimum value if \( a \) is ______________
    and a maximum if \( a \) is ______________.
11. Find it, and the value of \( x \) that produces it.