Pre-Calculus

Extremum Values WS

Sketch the graph of the given parabola and state the coordinates of its vertex, x and y intercepts and its maximum or minimum value.

1. \( y = x^2 - 8 \)
   - x intercept: \((-\sqrt{8}, 0) (\sqrt{8}, 0)\)
   - y intercept: \(0, -8\)
   - Vertex coordinate: \((0, -8)\)
   - Critical point: \((0, -8)\)

2. \( y = 4 - x^2 \)
   - x intercept: \((2, 0) (-2, 0)\)
   - y intercept: \((0, 4)\)
   - Vertex coordinate: \((0, 4)\)
   - Critical point: \((0, 4)\)

3. \( y = 2x^2 + 4x + 3 \)
   - x intercept: none
   - y intercept: \((0, 3)\)
   - Vertex coordinate: \((-1, 1)\)
   - Critical point: \((-1, 1)\)

4. \( 2x^2 - 20x + 57 \)
   - x intercept: none
   - y intercept: \((0, 57)\)
   - Vertex coordinate: \((5, 7)\)
   - Critical point: \((5, 7)\)
5. \( y = 3x^2 - 12x + 13 \)
   - x intercept: none
   - y intercept: \((0, 13)\)
   - vertex coordinate: \((1, \frac{73}{64})\)
   - Critical point: ___________

6. \( y = 1 - 6x - x^2 \)
   - x intercept: \((-2, 0), (1, 0)\)
   - y intercept: \((0, 1)\)
   - vertex coordinate: \((-3, 10)\)
   - Critical point: \((-3, 10)\)

7. A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?
   
   \[
   \text{Perimeter} \Rightarrow 2x + y = 2400 \\
   \text{Area} \Rightarrow xy \\
   x = 600, \ y = 1200, \ A = 720,000
   \]

8. A rectangle has a perimeter of 20 ft. Express the area \( A \) of the rectangle as a function of the length of \( x \) of one of its sides.
   
   \[
   \text{Perimeter} \Rightarrow 20 = 2x + 2y \\
   A(x) = x(20-2x)
   \]

9. Find two numbers whose sum is -24 and whose product is a maximum.
   
   \[
   x = -12, \quad \text{product: } 144 \\
   y = -12
   \]