

Question 5

Sketch the graph of the function:

$$f(x) = -|x - 3| + 2$$

Instructions: Identify the vertex, axis of symmetry, domain, range, and intercepts. Then sketch the graph of the function using transformations.

Question 5 - Solution

We are given:

$$f(x) = -|x - 3| + 2$$

Step 1: Parent function: $f(x) = |x|$

Transformations:

- Shift right by 3: $x \rightarrow x - 3$
- Reflect over x-axis: negative sign
- Shift up by 2

Step 2: Vertex:

Vertex at $(3, 2)$

Step 3: Axis of symmetry:

$$x = 3$$

Step 4: Domain and Range

Domain: $(-\infty, \infty)$

Range: $(-\infty, 2]$

Step 5: Intercepts

- **Y-intercept:** Set $x = 0 \Rightarrow f(0) = -|0 - 3| + 2 = -3 + 2 = -1$ - **X-intercepts:** Solve $f(x) = 0$

$$-|x - 3| + 2 = 0 \Rightarrow |x - 3| = 2 \Rightarrow x - 3 = \pm 2 \Rightarrow x = 1, 5$$

Final Answer Summary:

- Vertex: $(3, 2)$
- Axis of symmetry: $x = 3$
- Domain: $(-\infty, \infty)$
- Range: $(-\infty, 2]$
- X-intercepts: $x = 1, 5$
- Y-intercept: $y = -1$

