

MODULUS FUNCTION

$$|f(x)| = \begin{cases} f(x) & \text{if } f(x) \geq 0 \\ -f(x) & \text{if } f(x) < 0 \end{cases}$$

Solving Equations with Modulus

1. $|f(x)| = a$, where $a \geq 0$

Example: $|x^2 + 3x - 34| = 6$

$$\begin{array}{ll} x^2 + 3x - 34 = 6 & \text{or} \quad -(x^2 + 3x - 34) = 6 \\ x^2 + 3x - 40 = 0 & x^2 + 3x - 28 = 0 \\ (x + 8)(x - 5) = 0 & (x + 7)(x - 4) = 0 \\ x = -8 \text{ or } x = 5 & x = -7 \text{ or } x = 4 \end{array}$$

2. $|f(x)| = |g(x)|$

Example: $|2x - 5| = |x|$

$$\begin{array}{llll} 2x - 5 = x & \text{or} & 2x - 5 = -x & \text{alternatively} & (2x - 5)^2 = (x)^2 \\ x = 5 & & 3x = 5 & & (2x - 5)^2 - (x)^2 = 0 \\ & & x = \frac{5}{3} & & (2x - 5 + x)(2x - 5 - x) = 0 \\ & & & & (3x - 5)(x - 5) = 0 \\ & & & & x = \frac{5}{3} \text{ or } x = 5 \end{array}$$

Graphs, $y = |f(x)|$

Sketching

Step 1. Sketch $y = f(x)$

Step 2. Indicate all key features, e.g. axial-intercepts, stationary points, end points etc.

Step 3. Reflect portion(s) of graph below x -axis about the x -axis.

