Absolute Value Equations

Describe each solution intuitively.

1. $|x| = 4$ Solutions are a distance of 4 from 0

2. $|x + 2| = 3$ Solutions are a distance of 3 from -2

3. $|x - 7| = 4$ Solutions are a distance of 4 from 7

Solve and write solution in interval notation.

a) $|2x - 1| = 7$

$2x - 1 = 7$ $2x - 1 = -7$

$2x = 8$ $2x = -6$

$\boxed{x = 4}$ $\boxed{x = -3}$

✶ Check for extraneous Solutions!

$\{-3, 4\}$

b) $\dfrac{-2|x + 3|}{-2} = \dfrac{6}{-2}$

$|x + 3| = -3$

$\varnothing$

(Distance is always positive.)

c) $-2|7 - 3y| - 6 = -14$

$$|7 - 3y| = 4$$

$7 - 3y = 4$ $7 - 3y = -4$

$-3y = -3$ $-3y = -11$

$\boxed{y = 1}$ $\boxed{y = \frac{11}{3}}$

(Check Solutions!)

$$\left\{ 1, \frac{11}{3} \right\}$$

d) $|x + 6| = 2x$

$x + 6 = 2x$ $x + 6 = -2x$

$6 = x$ $6 = -3x$

~~$-2 = x$~~

$$\downarrow$$

$$\{ 6 \}$$

$|4| \neq -4$

e) $|x + 1| + 1 = 2x$

$$|x + 1| = 2x - 1$$ ←isolate abs. value

$x + 1 = 2x - 1$ $x + 1 = -2x + 1$ ←write 2 linear eqns.

$2 = x$ $3x = 0$

$\boxed{x = 2}$ ~~$x = 0$~~   ←solve & check

$$\{ 2 \}$$