

## Factoring out an absolute value

Consider  $x^{b/a}$ , that is,  $\sqrt[a]{x^b}$

### Applying absolute value

When you factor  $x$  out of a radical:

- ▶ If  $a$  is even, then  $x$  must be expressed as the absolute value:  $|x|$ .

$$\sqrt[4]{x^6} = |x| \cdot \sqrt[4]{x^2}$$

$$\sqrt{x^3} = |x| \cdot \sqrt{x}$$

- ▶ However, if the resulting  $|x|$  is raised to an even power, then you can drop the absolute value.

$$\begin{aligned} \sqrt[4]{x^{10}} &= |x|^2 \cdot \sqrt[4]{x^2} \\ &= x^2 \cdot \sqrt[4]{x^2} \end{aligned}$$

- ▶ All that said, if the exponent of  $x$  is odd, then  $x$  is restricted to values greater than or equal to zero, so the absolute value becomes unnecessary.

$$\sqrt[4]{x^6} = |x| \cdot \sqrt[4]{x^2}$$

$$\sqrt{x^3} = x\sqrt{x}$$

Since the domain requires  $x$  be positive, there's no reason for an absolute value.

Domain:  $x \geq 0$

### The Upshot

- ▶ You need the absolute value only when  $a$  and  $b$  are both even.