

# Precalculus

## Trickier logarithmic equations involving quadratics

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## Example

Solve the equation.

$$\lg(x + 2) + \lg(x - 1) = 1$$

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- $\log_a(st) = \log_a(s) + \log_a(t)$

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$$\lg(x+2) + \lg(x-1) = 1$$

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$$(x+2)(x-1) = 10^1$$

| Exp. base 10

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$$(\textcolor{red}{x} + 2)(\textcolor{red}{x} - 1) = 10^1$$

$$\textcolor{red}{x}^2 + x - 2 = 10$$

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$$(\textcolor{red}{x} + 2)(x - \textcolor{red}{1}) = 10^1$$

$$x^2 + \textcolor{red}{x} - 2 = 10$$

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$$(x + 2)(x - 1) = 10^1$$

$$x^2 + x - 2 = 10$$

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$$(x + 2)(x - 1) = 10^1$$

$$x^2 + x - 2 = 10$$

$$x^2 + x - 12 = 0$$

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$$x^2 + x - 12 = 0$$

$$(x - 3)(x + 4) = 0$$

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$$x = 3 \text{ or } x = -4$$

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- $\log_a(st) = \log_a(s) + \log_a(t)$
- Check whether answers are in domain of original expression:

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$$\lg(x+2) + \lg(x-1) = 1$$

Domain:  $x > 1$

$$\lg((x+2)(x-1)) = 1$$

Exp. base 10

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 $\lg(t)$  is not a real number for  $t < 0$ .

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- Recall  $\lg = \log_{10}$ .
- $\log_a(st) = \log_a(s) + \log_a(t)$ , rule does not hold for negative  $s, t$ .
- Check whether answers are in domain of original expression:  
 $\lg(t)$  is not a real number for  $t < 0$ .