

Precalculus

Basic exponent equation of type $e^{px+q} = A$

Todor Milev

2019

Example

Solve the equation.

$$e^{5-3x} = 10$$

Example

Solve the equation.

$$\begin{array}{rcl} e^{5-3x} & = & 10 \\ \ln(e^{5-3x}) & = & \ln 10 \end{array} \quad \text{apply } \ln$$

Example

Solve the equation.

$$\begin{aligned} e^{5-3x} &= 10 && \text{apply } \ln \\ \ln(e^{5-3x}) &= \ln 10 \\ 5 - 3x &= \ln 10 \end{aligned}$$

Example

Solve the equation.

$$\begin{aligned} e^{5-3x} &= 10 && \text{apply } \ln \\ \ln(e^{5-3x}) &= \ln 10 \\ \textcolor{red}{5} - 3x &= \ln 10 \\ 3x &= \textcolor{red}{5} - \ln 10 \end{aligned}$$

Example

Solve the equation.

$$\begin{array}{rcll}
 e^{5-3x} & = & 10 & \text{apply ln} \\
 \ln(e^{5-3x}) & = & \ln 10 & \\
 5 - 3x & = & \ln 10 & \\
 \textcolor{red}{3}x & = & 5 - \ln 10 & \\
 x & = & \frac{5 - \ln 10}{\textcolor{red}{3}} &
 \end{array}$$

Example

Solve the equation.

$$\begin{aligned}
 e^{5-3x} &= 10 && \text{apply } \ln \\
 \ln(e^{5-3x}) &= \ln 10 \\
 5 - 3x &= \ln 10 \\
 3x &= 5 - \ln 10 \\
 x &= \frac{5 - \ln 10}{3} \\
 \text{Calculator: } x &\approx 0.8991.
 \end{aligned}$$

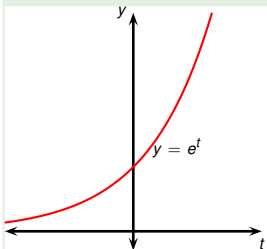
Example

$$e^{2x+3} = -1$$

Example

$$e^{3x-1} = 0$$

Example



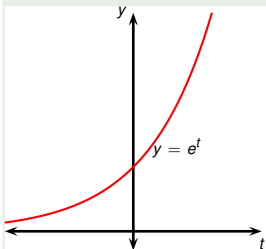
$$e^{2x+3} = -1$$

- Exponents (of real numbers) are positive, never negative.

Example

$$e^{3x-1} = 0$$

Example



$$e^{2x+3} = -1$$

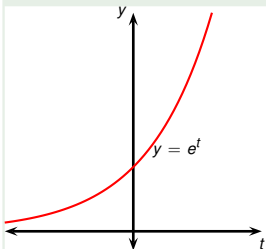
no real solution

- Exponents (of real numbers) are positive, never negative.
- \Rightarrow “No real solution” is an appropriate answer.

Example

$$e^{3x-1} = 0$$

Example



$$e^{2x+3} = -1$$

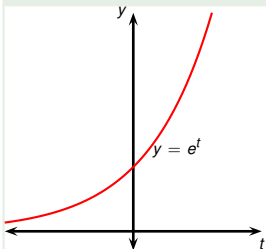
no real solution

- Exponents (of real numbers) are positive, never negative.
- \Rightarrow “No real solution” is an appropriate answer.
- Exponents of complex numbers can be negative (google Euler’s f-la).

Example

$$e^{3x-1} = 0$$

Example



$$e^{2x+3} = -1$$

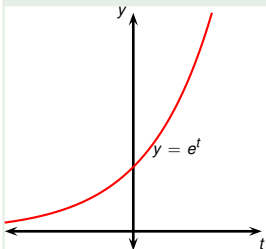
no real solution

- Exponents (of real numbers) are positive, never negative.
- \Rightarrow “No **real** solution” is an appropriate answer.
- Exponents of complex numbers can be negative (google Euler’s f-la).
- “no solution” is not appropriate.

Example

$$e^{3x-1} = 0$$

Example



$$e^{2x+3} = -1$$

no real solution

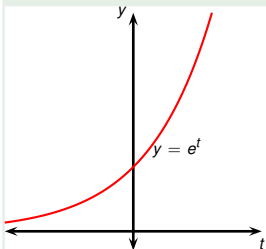
- Exponents (of real numbers) are positive, never negative.
- \Rightarrow “No real solution” is an appropriate answer.
- Exponents of complex numbers can be negative (google Euler’s f-la).
- “no solution” is not appropriate.

Example

$$e^{3x-1} = 0$$

- Exponents are never 0 (even for complex numbers).

Example



$$e^{2x+3} = -1$$

no real solution

- Exponents (of real numbers) are positive, never negative.
- \Rightarrow “No real solution” is an appropriate answer.
- Exponents of complex numbers can be negative (google Euler’s f-la).
- “no solution” is not appropriate.

Example

$$e^{3x-1} = 0$$

no solution

- Exponents are never 0 (even for complex numbers).
- “no solution” is the appropriate answer.