To solve an equation when the variable is in the exponent position, it is helpful to take the logarithm of both sides.

1. Solve $27^x = \frac{4}{7} \rightarrow \ln\left(27^x\right) = \ln\left(\frac{4}{7}\right) \rightarrow x\ln(27) = \ln(4) - \ln(7) \rightarrow$ x = $\frac{\ln(4) - \ln(7)}{\ln(27)} =$ -0.1697947473

2. $5000.00 is invested at a 2% Annual Interest Rate compounded Monthly. How many years will it take to have an amount of $5779.50? Round your answer to 2 decimal places.
Solution:

$5779.50 = 5000\left(1 + \frac{0.02}{12}\right)^{12t} \rightarrow$ Divide Both Sides by 5000 $\rightarrow \frac{5779.50}{5000} = \left(1 + \frac{0.02}{12}\right)^{12t}$

Take the log of both sides: $\log\frac{5779.50}{5000} = \log\left(1 + \frac{0.02}{12}\right)^{12t} = 12t\ \log\left(1 + \frac{0.02}{12}\right)$

$$t = \frac{\log\left(\frac{5779.50}{5000}\right)}{12\log\left(1 + \frac{0.02}{12}\right)} = \text{7.25 Years}$$

3. Solve $5^{3x} = 7^{2x-1}$
$\ln(5^{3x}) = \ln(7^{2x-1}) \rightarrow 3x \ln 5 = (2x - 1) \ln 7 \rightarrow 3x \ln 5 = 2x \ln 7 - \ln 7 \rightarrow 3x \ln 5 - 2x \ln 7 = -\ln 7$
$x(3 \ln 5 - 2 \ln 7) = -\ln 7 \rightarrow x = \frac{-\ln 7}{3\ln 5 - 2\ln 7} =$ -2.077868427

4. $4892.22 is invested at a 3.2% Annual Interest Rate compounded Continuously. How many years will it take to have an amount of $6244.47? Round your answer to 3 decimal places.
Solution:

$6244.47 = 4892.22\ e^{0.032t} \rightarrow \frac{6244.47}{4892.22} = e^{0.03t} \rightarrow \ln\left(\frac{6244.47}{4892.22}\right) = \ln\left(e^{0.03t}\right) = 0.03t \ln e = 0.03t$

$$\ln\left(\frac{6244..47}{4892.22}\right) = 0.03t \rightarrow t = \frac{\ln\left(\frac{6244.47}{4892.22}\right)}{0.03} = \text{8.135 years}$$

5. Simplify $10^{\log 7x}$
Let $10^{\log 7x} = w \rightarrow$ Write in Logarithmic Form: $\log w = \log 7x \rightarrow w =$ 7x
Recall: $b^{\log_b n} = n$ In the above problem, b = 10 and n = 7x

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1. $\log_3 9$ Rewrite, using natural logarithms.

2. Solve: $2^x = 38.426$

3. Solve: $\left(1 + \frac{0.04}{7}\right)^{5x} = 5000$

4. Solve: $e^{9t} = 42.1$

5. Solve: $x^{19} = 103$

6. $\log_7 12$ Rewrite, using natural logarithms.

7. \$7010 Earns an Annual Interest Rate of 3.7% Compounded 5 times per year for 13 years. Find the final value.

8. \$7010 Earns an Annual Interest Rate of 3.7% Compounded Continuously for 13 years. Find the final value.

9. Solve: $4^{3x+2} = 11^{x-1}$