$A = P\left(1 + \frac{r}{n}\right)^{nt}$

Graph the following exponential function and describe its transformation from the graph $g(x) = \log_2 x$. State the domain and range.

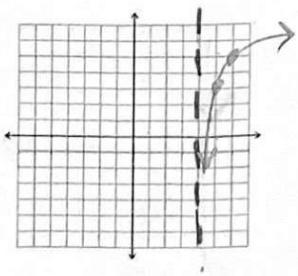
1. $f(x) = 2\log_2(x-4) + 3$

↑ stretch 2 → 4 ↑ 3

$a = 2$, $b = 2$, $h = 4$, $k = 3$

D: $x > 4$ or $(4, \infty)$

R: $\mathbb{R}$ or $(-\infty, \infty)$



2. You deposit \$1800 in an account that earns 6.4% annual interest. Find the time it takes to double the amount if the interest is compounded quarterly. $n = 4$

$3600 = 1800\left(1 + \frac{.064}{4}\right)^{4t}$

$\ln 2 = \ln(1.016)^{4t}$

$\frac{\ln 2}{4\ln(1.016)} = \frac{4t \cdot \ln(1.016)}{4 \cdot \ln(1.016)}$

$t = 10.9$ years

3. Simplify: $2e^{3x} \cdot 4e^{-5x} \cdot 6e^{2x-3}$

$= 2 \cdot 4 \cdot 6 \cdot e^{3x} \cdot e^{-5x} \cdot e^{2x-3}$

$= 48e^{-3}$ (add exp)

4. Graph the following function and describe its transformation from the graph $y = \log_4 x$. Also state its domain and range.

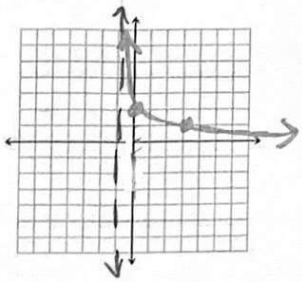
$f(x) = -\log_4(x+1) + 2$

Reflect ← 1 ↑ 2

$a = -1$, $b = 4$, $h = -1$, $k = 2$

D: $x > -1$ $(-1, \infty)$

R: $\mathbb{R}$ $(-\infty, \infty)$



Rewrite the following in either exponential form or logarithmic form.

5. $\log_4 64 = 3$

$4^3 = 64$

6. $8^{1/3} = 2$

$\log_8 2 = \frac{1}{3}$

Evaluate the logarithmic functions without a calculator. No decimal answers.

7. $\log_3 9 = 2$ or $\log_3 3^2 = 2$

$3^{\square} = 9$

8. $\log_2 \frac{1}{16} = -4$ or $\log_2 2^{-4} = -4$

$2^{\square} = \frac{1}{16}$

Simplify the following using inverse properties. No decimal answers.

9. $\log_3 27^x - e^{\ln 4} + \log_2 16$

$\log_3 3^{3x} - 4 + \log_2 2^4$

$3x - 4 + 4 = 3x$

10. $\log_4 64^{-3x}$

$\log_4 (4^3)^{-3x} = \log_4 4^{-9x} = -9x$

Evaluate the following logarithmic expressions using

$\log 4 \approx 0.602$ and $\log 7 \approx 0.845$.

11. $\log \frac{7}{16} = \log \frac{7}{4^2} = \log 7 - \log 4^2$

$= \log 7 - 2\log 4 = 0.845 - 2(.602) = -0.359$

Expand the following expression:

12. $\log_7 \frac{12x^8}{8y} = \log_7 12 + \log_7 x^8 - \log_7 8 - \log_7 y$

$= \log_7 12 + 8\log_7 x - \log_7 8 - \log_7 y$

Condense the following expression:

Note: $9^{\frac{1}{2}} = \sqrt{9} = 3$

13. $\log 8 + \frac{1}{2}\log 9 - \log 2$

$\log 8 + \log 3 - \log 2 = \log\left(\frac{8 \cdot 3}{2}\right) = \log 12$

Evaluate the following using the change of base formula. Give the exact solution.

14. $\log_8 6$ $= \frac{\log 6}{\log 8}$ or $\frac{\ln 6}{\ln 8}$ (exact sol.) $= 1.161$ approx sol. (rounded)

Solve the following exponential equations. Round to 2 decimal places.

15. $16^{3x} = 4^{x-4}$

$(4^2)^{3x} = 4^{x-4}$

$6x = x - 4$

$5x = 4$

$\Rightarrow x = \frac{4}{5}$

16. $7^x + 2 = 16$

$-2 \quad -2$

$\ln 7^x = \ln 14$

$x \ln 7 = \ln 14$

$\frac{x \ln 7}{\ln 7} = \frac{\ln 14}{\ln 7} \Rightarrow x = 1.356$

OR $7^x = 14$

$\log_7 7^x = \log_7 14$

$x = \frac{\log 14}{\log 7}$

17. How long would it take for \$5000, invested in an account earning 7% compounded continuously, to earn \$1000 in interest? Total of 6000 in the account ☺

$A = Pe^{rt}$

$6000 = 5000 e^{.07t}$

$\ln\left(\frac{6}{5}\right) = \ln e^{.07t}$

$\frac{\ln\left(\frac{6}{5}\right)}{.07} = \frac{.07t}{.07} \Rightarrow t = 2.6$ years

Solve the following logarithmic equations.
Round to 2 decimal places.

18. $\log_4 5x = \log_4 (7x - 8)$

$5x = 7x - 8$

$-7x \quad -7x$

$-2x = -8$

$x = 4$

19. $\log x + \log (x + 2) = \log 35$

$\log x(x+2) = \log 35$

$x^2 + 2x = 35$

$x^2 + 2x - 35 = 0$

$(x+7)(x-5) = 0$

$x = -7, 5$

extr.

$x = 5$

Simplify:

20. $\log_3 27 + \ln(e^3) - \log 10^4 - 3\log_2 32 + e^{\ln 3}$

$\log_3 3^3 + 3 - 4 - 3 \cdot \log_2 2^5 + 3$

$3 + 3 - 4 - 3 \cdot 5 + 3$

$= -10$

21. **Condense**: $\log_2 6x - 3\log_2(2y) + \log_2 24 - \log_2 3z$

$\log_2 6x - \log_2 8y^3 + \log_2 24 - \log_2 3z = \log_2\left(\frac{6x \cdot 24}{8y^3 \cdot 3z}\right) = \log_2\left(\frac{6x}{y^3 z}\right)$

22. You want to have \$1000 in your savings account. Find the amount that you should deposit if the account pays 4% annual interest over a period of 5 years.

$r = .04 \quad n = 1 \quad t = 5$

$1000 = P(1 + .04)^5$

$1000 = P(1.2166529\ldots)$

$P = \$821.93$