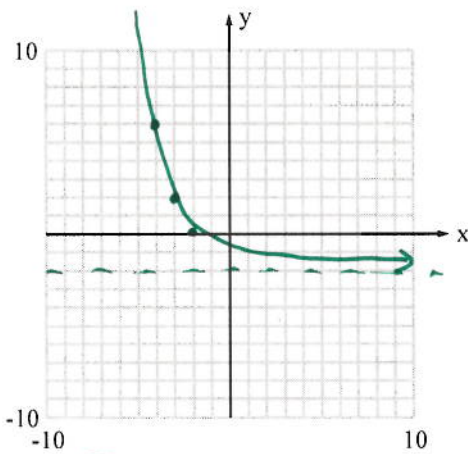Graph the function. Show the transformation of 3 points. State the domain and range. Be sure to draw in any asymptotes.

log function vertical asymptote

1. $f(x) = 4\left(\frac{1}{2}\right)^{x+3} - 2$ *left 3, down 2*

Parent	Stretch & Shift
(0, 4)	(-3, 2)
(1, 2)	(-2, 0)
(-1, 8)	(-4, 6)

D:___ℝ___   R: $y > -2$

2. $y = \log_4(x+2) - 1$ *left 2 down 1* $4^y = x$

climb to right

Parent	Stretch & Shift
(1, 0)	(-1, -1)
(4, 1)	(2, 0)
(2, $\frac{1}{2}$)	(0, $-\frac{1}{2}$)

D:___$x > -2$___   R:___ℝ___
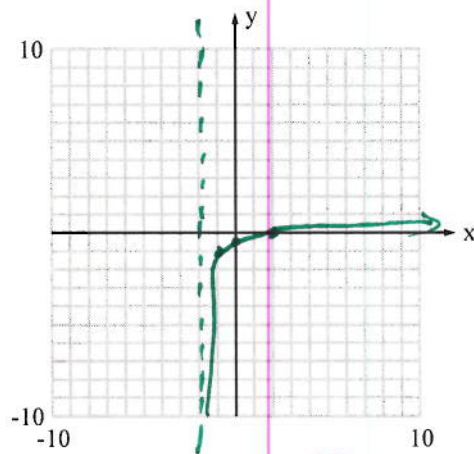
Simplify each expression.

3. $\dfrac{5e^2(-2e^{-7})}{4e^3}$ $\dfrac{5 \cdot -2e^2}{4e^3 \cdot e^7} = \dfrac{-10e^2}{4e^{10}}$

either $\boxed{-\dfrac{5}{2}e^{-8} = \dfrac{-5}{2e^8}}$

4. $\left(5e^{4x}\right)^{-3}$ $5^{-3}e^{-12x}$ $\boxed{= \dfrac{1}{125}e^{-12x}}$

or $\dfrac{1}{125e^{12x}}$

Write each equation in exponential form.

5. $\log_5 10 = x$

$\boxed{5^x = 10}$

6. $\ln x = 12$

$\boxed{e^{12} = x}$

Evaluate each logarithm.

7. $\log_4 64 = x$

$4^x = 64$
$4^x = 4^3$
$\boxed{x = 3}$

8. $\log_3\left(\dfrac{1}{81}\right) = x$

$3^x = \dfrac{1}{81}$
$3^x = 3^{-4}$ $\boxed{x = -4}$

9. Condense into a single logarithm. Then simplify fully.

$$5\log_4 2 + 3\log_4 x - 2\log_4 3 - \log_4 y$$

$\underline{\log_4 2^5 + \log_4 x^3 - \log_4 3^2 - \log_4 y}$

$\log_4 32x^3 - \log_4 9$

$\rightarrow \log_4 \dfrac{32x^3}{9} - \log_4 y$

$$\boxed{= \log_4 \dfrac{32x^3}{9y}}$$

10. Expand the logarithm and simplify.

$$\log_3\left(\dfrac{27x}{10\sqrt[4]{y}}\right)$$

$\log_3 27x - \log_3 10\sqrt[4]{y}$

$\boxed{\begin{array}{l} \log_3 27 + \log_3 x - \left(\log_3 10 + \log_3 y^{1/4}\right) \\[4pt] \log_3 27 + \log_3 x - \log_3 10 - \log_3 y^{1/4} \end{array}}$ either

Solve each equation. Show work. Check for extraneous answers.

11. $8^{x+2} = 16^{2x+9}$

$2^{3(x+2)} = 2^{4(2x+9)}$

$3x + 6 = 8x + 36$

$3x = 8x + 30$

$-5x = 30$

$\boxed{x = -6}$

12. $\log_6(4x - 3) = \log_6(9 + 2x)$

$4x - 3 = 9 + 2x$

$2x - 3 = 9$

$2x = 12$

$\boxed{x = 6}$

Given: $\log_7 3 = a$ and $\log_7 8 = b$. **Evaluate the following logs in terms of a & b.**

13. $\log_7\left(\dfrac{64}{9}\right)$

$\log_7 64 - \log_7 9$

$\log_7 8^2 - \log_7 3^2$

$2\log_7 8 - 2\log_7 3$

$\boxed{2b - 2a}$

14. $\log_7 72$

$\log_7 8 \cdot 9$

$\log_7 8 + \log_7 9$

$\log_7 8 + \log_7 3^2$

$\log_7 8 + 2\log_7 3$

$\boxed{b + 2a}$

Part 2 - Calculator allowed

decay $y = a(1-r)^t$

1. **You bought a new motorcycle for $14,000 in 2012. The value decreases by 18% each year.**

   a) Write a model that gives the motorcycle's value after t years. $y = 14,000(.82)^t$

   b) Find the value of the car in 2016. Round to the nearest dollar. 6329.70
      $t = 4$

   show using change of base!

   c) Find the year when the value of the car will be less than $5000. *year 6 between year 5 + 6*
      calc. use trace or table. ≈ 5.2 *years*

2. **You deposit $5,500 in an account that pays 1.75%. How much money will be in the account after 10 years based on how often the money is compounded?   SHOW SET UP.**

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

   a) monthly   Set-up: $5500\left(1+\frac{.0175}{12}\right)^{12 \cdot 10}$ a) $\$6551.02$

   $A = Pe^{rt}$

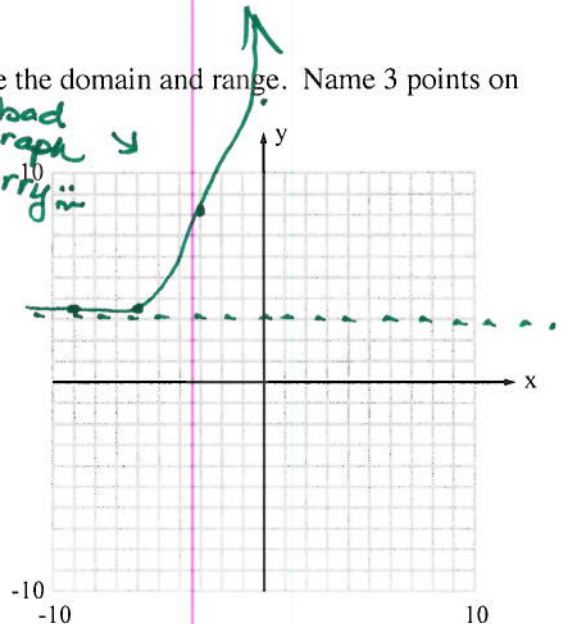   b) continuously   Set-up: $5500e^{.0175 \cdot 10}$ b) $\$6551.85$

3. Draw the graph of $y = 2e^{x+4} + 3$ including the asymptote. State the domain and range. Name 3 points on your graph. Any rounded values should be to 3 places.

   Domain: $\mathbb{R}$

   Range: $y > 3$

x	y
-9	3.014
-6	3.271
-3	8.437
0	112.2

   bad graph sorry...

4. The number of salmon (in thousands) in Lake Michigan can be modeled by $P = 242e^{1.4t}$ where t is the number of years since 2007. How many salmon will likely be in Lake Michigan in 2018?

   $P = 242e^{1.4(11)}$ $\hookrightarrow t = 11$

   $1,180,185,806,000$
   wow!!

5. You deposit $4250 in an account that pays 2.25% annual interest. How long does it take the balance reach $5000 when the interest is compounded quarterly? Show work.

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

$$A = 4250\left(1 + \frac{.0225}{4}\right)^{4t}$$

← on calc. used table $\boxed{8 \text{ years}}$

Solve each equation. Check for extraneous solutions. Round the result to three decimal places if necessary. Show all work.

6. $6^{4x-3} = 11$

$\log 6^{4x-3} = \log 11$

$4x-3 \ \log 6 = \log 11$

$4x-3 = \dfrac{\log 11}{\log 6}$

$4x-3 = 1.338$

$\boxed{x \approx 1.085}$

7. $3e^{x+4} - 7 = 8$

$e^{x+4} = 5$

$\ln e^{x+4} = \ln 5$

$x+4 \ \ln e = \ln 5$

$x = \ln 5 - 4$

$\boxed{x = -2.391}$

8. $4\log_3(x-8) = 16$

$\log_3(x-8) = 4$

$3^4 = x - 8$

$81 = x - 8$

$\boxed{x = 89}$

9. $\log_2 x + \log_2(x-2) = 3$

$\log_2 x(x-2) = 3$

$2^3 = x(x-2)$

$0 = x^2 - 2x - 8$

$0 = (x-4)(x+2)$

$\boxed{x=4}, \cancel{-2} \text{ extraneous}$

$\log_2 4 + \log_2(2) = 3$

$\log_2 8 = 3 \ \checkmark$