1. Rewrite the exponential equations in logarithmic form and logarithmic equations in exponential form. If possible, simplify your answers.

Exponential Equation	Logarithmic Equation
$4^x = 5$	
$e^{x-3} = 2$	
	$log_3(x) = 2$
	$\log(x+2) = -3$
	$\ln(x-5) = 2$

2. Use properties of logarithms to do the problems below.

A. Fill in the missing values to make the statement a true statement.

   a. $\log_5 81 - \log_5(\qquad) = \log_5 3$
   b. $2\log_3 5 = \log_3(\qquad)$

B. Expand the following. Each logarithm in your answer should involve only one variable. Assume that variables are positive.

   a. $\log(x^{-3}y^6) =$
   b. $\log_2\left(\frac{y^3}{\sqrt{x}}\right) =$

C. Compute the values below exactly.

   a. $\log_3 9 =$
   b. $\log 0.0001 =$
   c. $\log_2\left(\frac{1}{2}\right) =$

3. State a formula for the value of each compound interest account after t years. An account with \$5000 and earns 6.2%/yr interest compounded annually.

4. Population growth is modeled with exponential functions in several equivalent formats where P_0 is the population at $t = 0$.

   a. If the percentage growth over a one-year period is known, then we treat it like annual compounding and get $P(t) = P_0(1+r)^t$.
   b. If the continuous growth rate is known, then we use $P(t) = P_0 e^{rt}$ just like continuous compounding interest problems.
   c. If the time it takes a population to double is known, then we write the exponential function in terms of the base-two exponential as $P(t) = P_0 \cdot 2^{\frac{t}{T_d}}$

5. State formulas for each population growth problem below.
   a. Wisconsin's population was 5,000,000 at $t = 0$ in 2010 and is growing 0.35% each year.

   b. The U.S. population was 310,000,000 in 2010 at $t = 0$ and has a continuous growth rate of 0.97% per year.

   c. A blood infecting bacteria grows rapidly and has a doubling time of 30 minutes. Find the exponential function that gives the number of bacteria t minutes after a puncture wound introduces 50 of the microbes into the blood stream.

6. The radioactive substance Uranium-240 has a half-life of 14 hours. The amount $A(t)$ of a sample of Uranium-240 remaining in grams after t hours is given by the exponential function.

$A(t) = 3000\left(\frac{1}{2}\right)^{\frac{t}{14}}.$

   a. Find the initial amount in the sample.

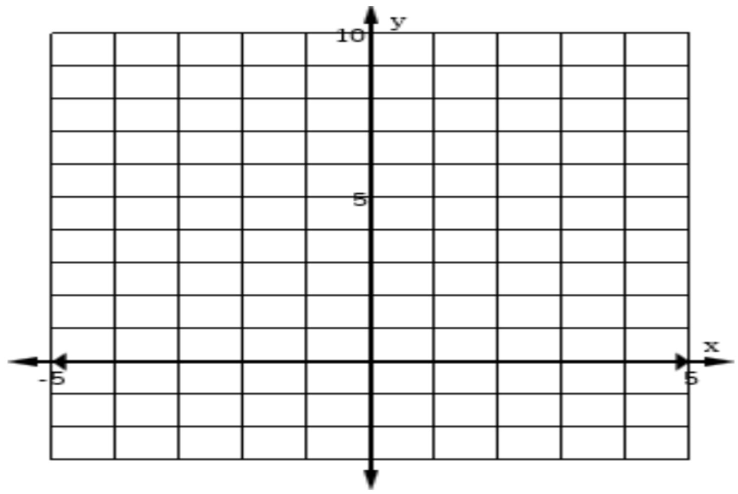
   b. Find the amount remaining after 30 hours. Round your answer to the nearest gram.

   c. Determine how many grams remain after two years.

7. Fill in the table of values as needed. List the asymptotes and then sketch the graphs of the functions below. Please list the domain and rage as well.

   a. $y = 2^x$

x	y

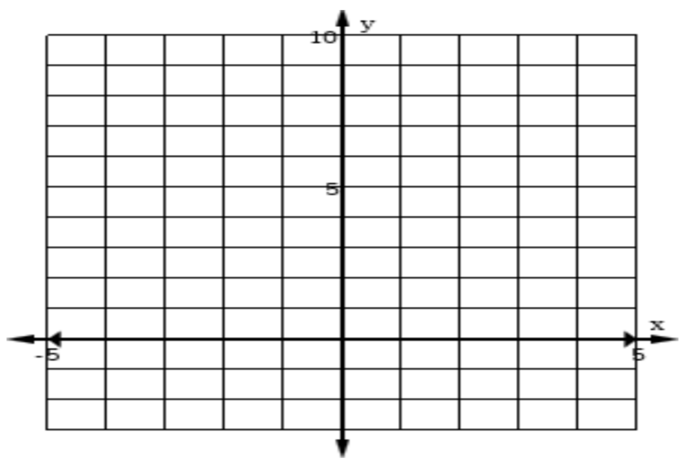


Asymptote is ______________

Domain ______________Range_______________

   b. $= \left(\frac{1}{2}\right)^x$

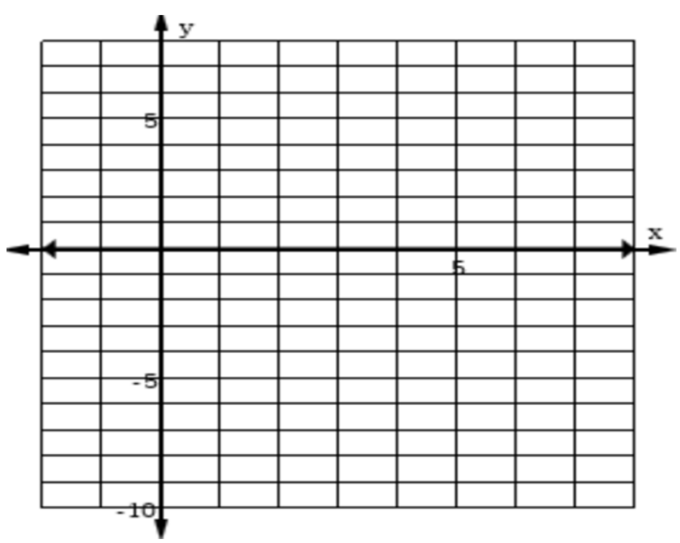
x	y



Asymptote is _________________

Domain ______________Range_______________

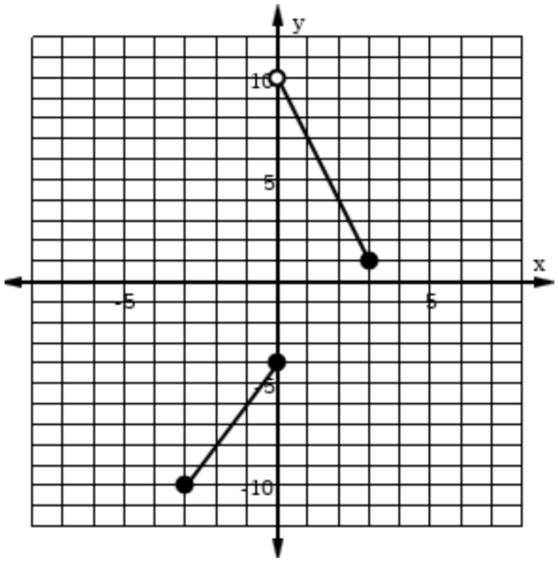
   c. $y = log_2(x)$



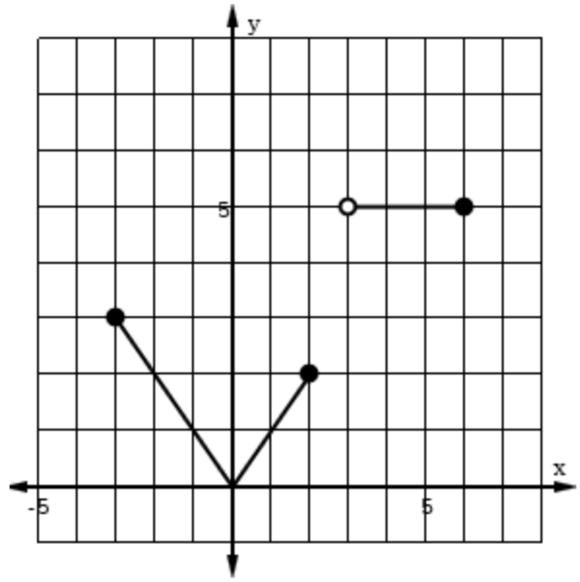
Domain ______________Range_______________

8. Obtain the piece-wise formula for the functions whose graphs are given below. If the functions below are one-to-one, please also find the formulas for their inverse functions and sketch their graphs.

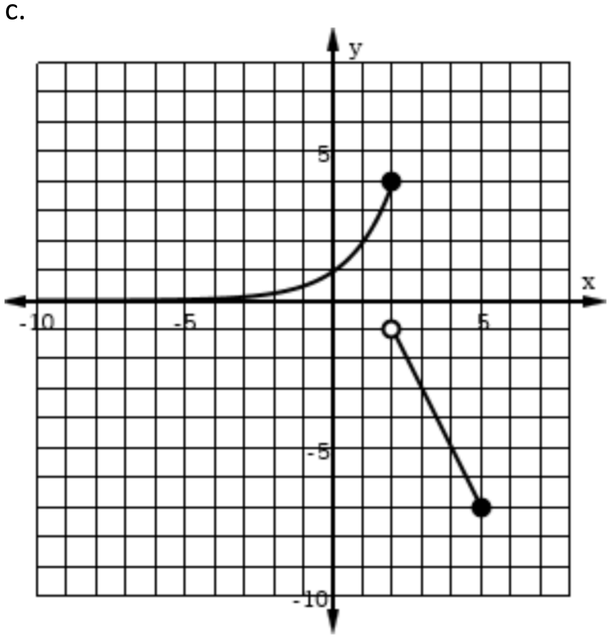
a.



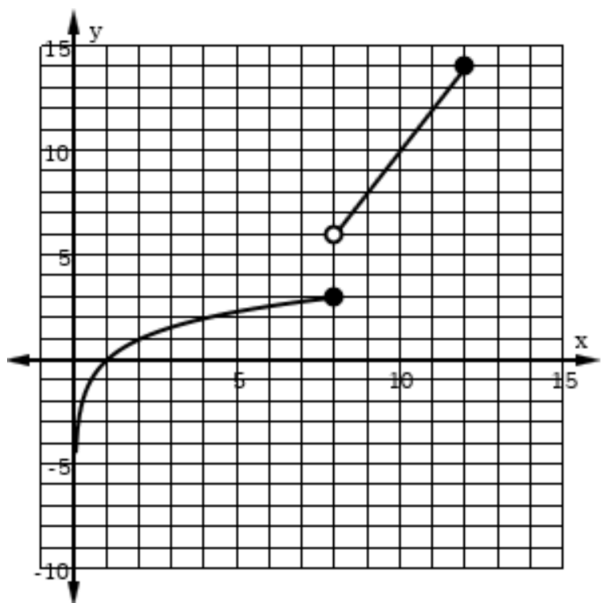
b.



c.



d.



9. Find the first 4 terms of the sequences given below.

$a_n = n^{th}$ term of the sequence	First term	Second term	Third term	Fourth term	
$a_n = 5\left(\frac{1}{2}\right)^{2n+1}, n = 0,1,2,\ldots$					☐ Arithmetic ☐ Geometric ☐ Neither
$a_n = 5 - 2n,$ $n = 3,4,5,\ldots$					☐ Arithmetic ☐ Geometric ☐ Neither
$a_n = \frac{(-1)^n}{2n}, n = 1,2,\ldots$					☐ Arithmetic ☐ Geometric ☐ Neither

10. For a given arithmetic sequence, the 29^{th} term, $a_{29} = -70$ and the 6^{th} term, $a_6 = -142$. Find the linear function for a_n and find the 133^{rd} term a_{133}.

11. Create your own arithmetic sequence and show you would find the 1002nd term in your sequence.

12. Create your own geometric sequence and show you would find the 1002nd term in your sequence.

13. Create your own sequence that is neither a geometric nor arithmetic and show you would find the 1002nd term in your sequence.

14. Determine if the functions below are odd, even, neither.

a. $y = x^4 - x^2$

☐ Odd
☐ Even
☐ Neither

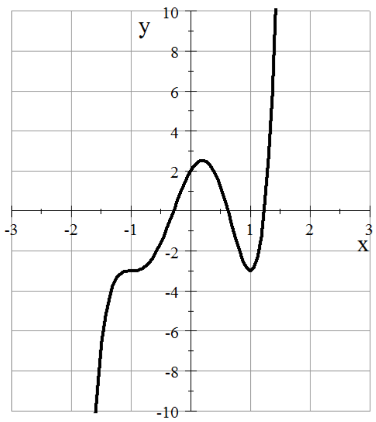
b. $y = x^3 + 4$

☐ Odd
☐ Even
☐ Neither

c. $y = x^3 - 3x$

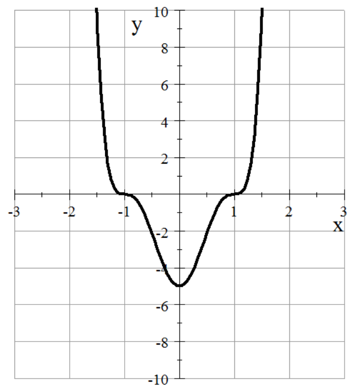
☐ Odd
☐ Even
☐ Neither

d.



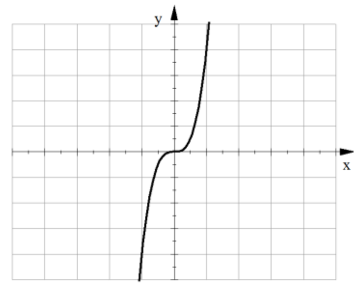
Odd Even Neither

a.



Odd Even Neither

b.



Odd Even Neither

15. Create a function of each type listed below.
    a. Odd
    b. Even
    c. Neither

Which of these functions are one-to-one? Do you think an even function can be one-to-one? Explain your answer