Math110 .
Exponential and Logarithmic Functions. **HO #3**
Worksheet.

The following problems will help you in your study about Exponential and Logarithmic Functions and their Applications. This is an extra source for revising the material for Exam 3.
Some problems (rated with *) are in advance level, however, they are very useful for better understanding of main ideas.

1. Let $f(x) = \log_4(x-1)$

   a) State the domain and range of $f(x)$.

Domain	
Range	

   b) Write the equation of the vertical asymptote.

   c) Find the inverse function $f^{-1}(x)$.

$f^{-1}(x) =$

   d) State the domain and range of $f^{-1}(x)$.

Domain	
Range	

   e) Write the equation of asymptote (if any) for $f^{-1}(x)$.

   f) the graphs of $f(x)$ and $f^{-1}(x)$. Label the asymptote(s).

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2. Let $f(x) = 2^x - 3$

a) State the domain and range of $f(x)$.

Domain	
Range	

b) Write the equation of the horizontal asymptote.

c) Find the inverse function $f^{-1}(x)$.

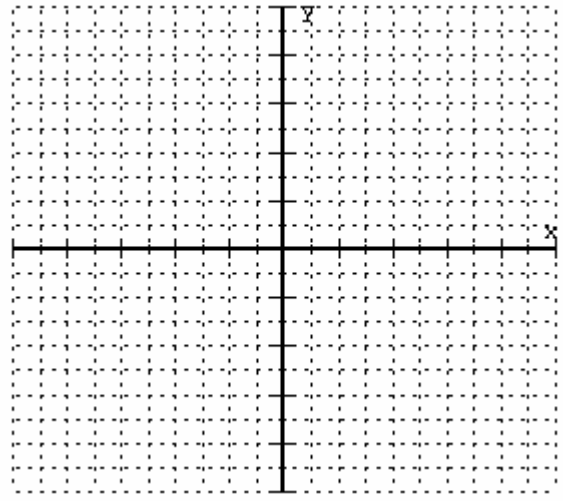
$f^{-1}(x) =$

d) State the domain and range of $f^{-1}(x)$.

Domain	
Range	

e) Write the equation of asymptote (if any) for $f^{-1}(x)$.

f) Sketch the graphs of $f(x)$ and $f^{-1}(x)$. Label the asymptote(s).



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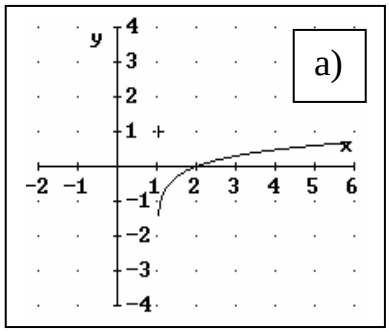
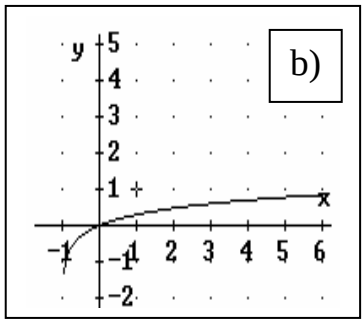
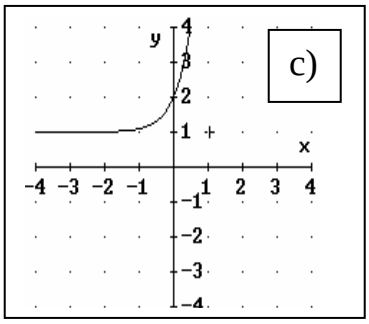
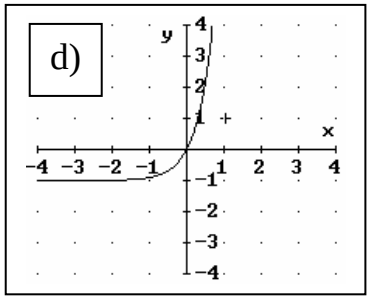
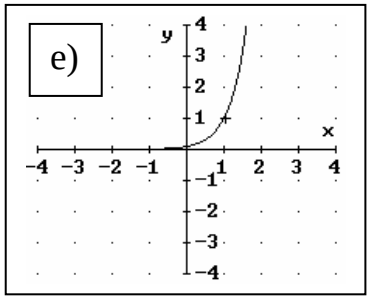
3. Which graph corresponds to $f(x)=\log(x-1)$?











f) None of these

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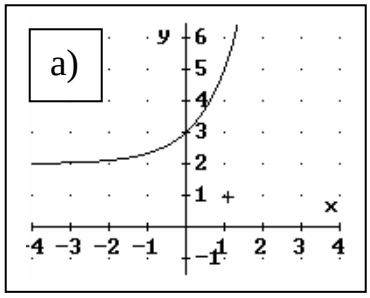
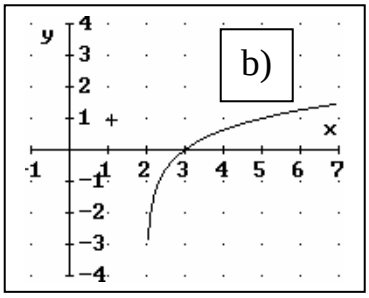
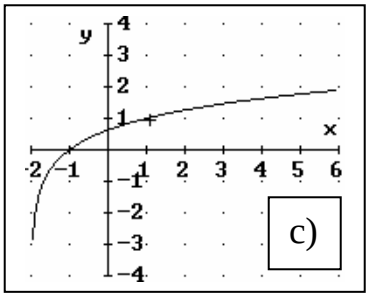
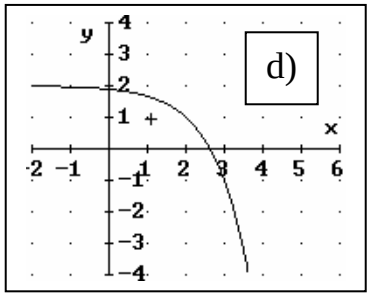
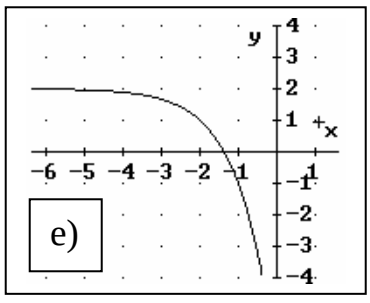
4. Which graph corresponds to $f(x)=3^x+2$?











f) None of these

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5. Write the sequence of transformations that leads from $f(x)=\log_3 x$ to
   a) $g(x)=-\log_3(x-4)+2$.

   b) $g(x)=-\log_3(x+4)-2$

   c) $g(x)=\log_3(x+4)-2$

6. Write the sequence of transformations that leads from $f(x)=3^x$ to
   a) $g(x)=-3^{x+2}-1$.

   b) $g(x)=3^{x-2}+1$

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

7*. Given

$\log_b 11=1.3383$	$\log_b 5=0.8982$	$\log_b 3=0.6131$

Use the properties of the logarithms and given INFO to fill out the following table

$\log_b 55=$	$\log_b 5\sqrt{11}=$	$\log_b 9=$	$\log_b \frac{3}{5}=$	$\log_b \frac{11}{9}=$

8. Fill out blanks. Show your work with Change-of-base formula.

a) $\log_3 13 =$_____

b) $\log_2 25 =$_____

9. Find according the definition of the logarithm.
Don't use the Change-of-base formula.

a) $\log_{\sqrt{3}} 27 =$

b) $\log_{\frac{1}{3}} 81 =$

c) $\log_5 125 =$

d) $\log_{e^2} e =$

e) $\log 0.0001 =$

f) $\log_{0.01} 1000 =$

g) $\log_{\sqrt{2}} \frac{1}{4} =$

10. Express each of the following expressions as a single logarithm whose coefficient is equal to 1.

a) $\frac{1}{5}\left[3\log(x+1)+2\log(x-3)-\log 7\right]$

b) $\frac{1}{2}\left[\ln(x+1)+2\ln(x-1)\right]+\frac{1}{3}\ln x$

c) $\frac{1}{2}\ln(x+3)-\frac{1}{5}\left[\ln x+3\ln(x+1)\right]$

d) $\frac{1}{2}\left[\log(x-2)+2\log(x+2)-\log 5\right]$

11. Expand a much as possible each of the following.

a) $\log\sqrt[3]{\frac{x^2y}{z^5}}$

b) $\ln\sqrt[4]{\frac{x^3y}{z^3}}$

12*. Use properties of the logarithms to write each expression as a single term that does not contain logarithms.

a) $10^{\log 5x^2 + \log 3x} + e^{\ln 16x^7 - \ln 2x^4}$

Answer: $23x^3$

b) $a^{2\log_a x^2 y - 3\log_a xy}$

c) $c^{\frac{1}{3}\log_c 27x - 2\log_c x^2 y}$

d) $9^{2\log_3 x}$

e) $2^{\log_4 x}$

13. Use a graphing utility to evaluate of the following.
Round answers to six decimal places.

a) $e^{-0.000121 \cdot 50}$

Answer: 0.993968

b) $\ln\left(2+\sqrt{3}\right)$

Answer: 1.316958

c) $k = \dfrac{\ln \frac{1}{2}}{4020}$

Answer: -0.0001724

d) $k = \dfrac{\ln 2}{5025}$

Answer: 0.0001394

14. Use the definition and properties of logarithmic functions to solve the following equations.

a) $\log_2(x-1) = 3$

b) $\log(x+1) = -2$

c) $\ln(2x-1) = 1$

d) $\log(x+7)+\log(x+3)=\log(4x+16)$

e)* $\log|x|=2$

f) $\log(x^2-x)=\log 6$

g) $\log_2(x-4)+\log_2(x-5)=\log_2(-5x+17)$

h) $\log_{\frac{1}{2}}(x+4)=-3$

i) $\log(x-15)=-2$

k) $\ln(x+3)=1$

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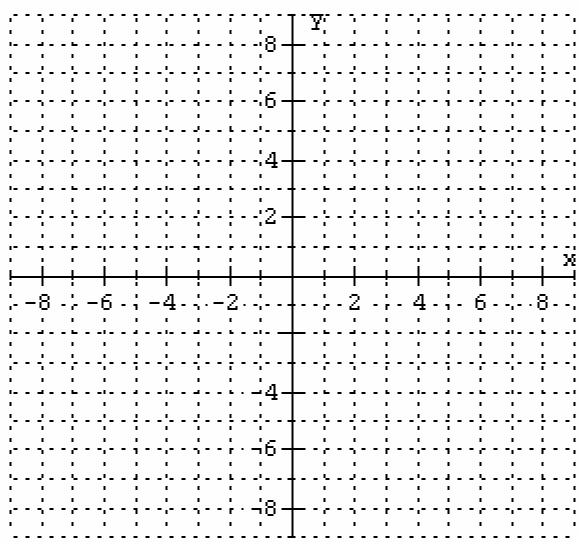
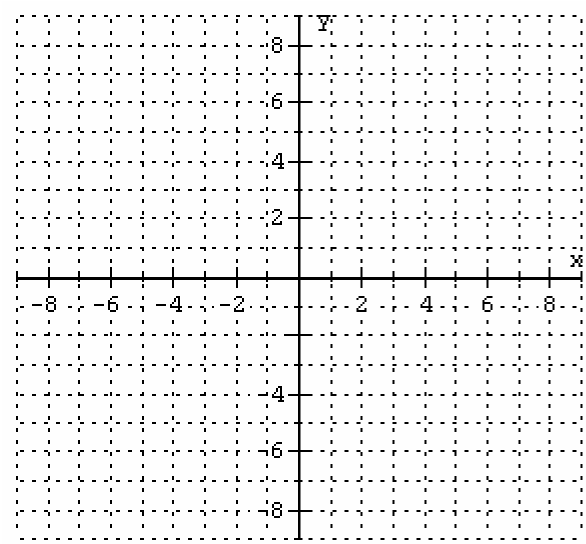
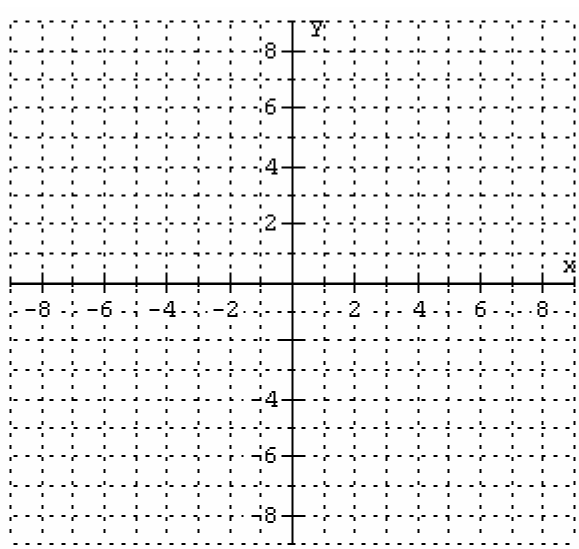
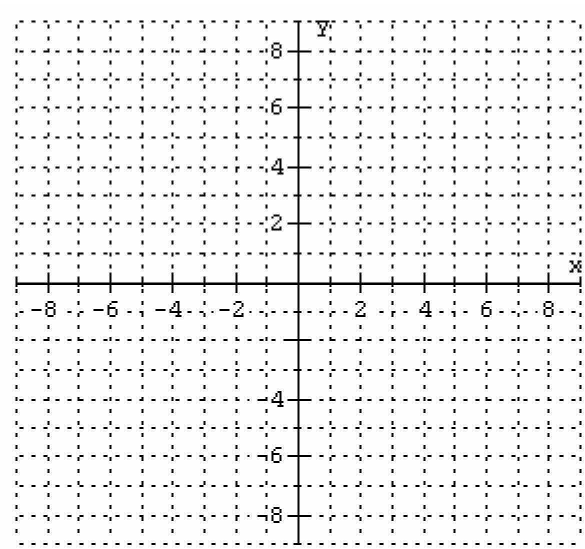
15. Use the graph of the logarithmic function $y = \log_2 x$ to sketch the graphs

of the following functions

a) $y = \log_2(-x)$; b) $y = \log_2(x+1)$; c)
d) $y = \log(x-1)+3$; e) $y = \log(x+2)-3$; f) $y = -\log(x+2)+1$

State the domain and range of each function on the base of the formula.

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