

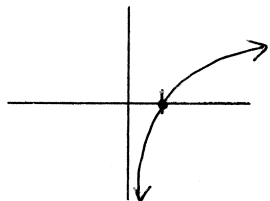
Logs: Fact or Fiction?
No calculator for this side!

Name: Key

Period: _____

1. Sketch these.

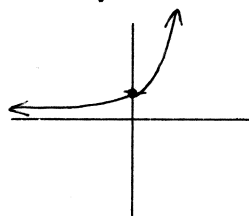
a. $y = \ln x$



Domain: $(0, \infty)$

Range: $(-\infty, \infty)$

b. $y = e^x$



Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

2. Fill in the blank.

a. $\log_2 16 = 4$ means $2^4 = 16$

b. $\log_3 \frac{1}{27} = -3$ $3^x = \frac{1}{27}$

c. $\log 0.0001 = -4$

d. $\log 100,000 = 5$ $10^x = 100,000$

e. $\ln x = y$ means $e^y = x$

f. $\ln 1 = 0$ $e^x = 1$

$10^x = 0.0001$
 $= \frac{1}{10,000}$

3. Which are true?

a. $\ln xy = \ln x + \ln y$ True

$\ln a + \ln x = \ln x + \text{constant}$
b. $\ln ax = \ln x + c$ (c is a constant) True

c. $\ln \frac{x}{y} = \ln x - \ln y$ True

d. $\ln \frac{1}{x} = -\ln x$ $\ln \frac{1}{x} = \ln 1 - \ln x = 0 - \ln x = -\ln x$ True

e. $\ln x^a = a \ln x$ True

f. $\ln(-x) = 0$ False
Negative x values are not in the domain of natural log.

4. Evaluate:

a. $\ln 0 = \text{DNE}$

b. $\ln \sqrt{x} = \frac{1}{2} \ln x$ c. $\ln e^{x^2} = x^2$

d. $\ln 1 = 0$

e. $\ln e^3 = 3$ f. $\ln(-1) = \text{DNE}$

g. $\ln e = 1$

h. $\ln e^x = x$ i. $\ln 0.5 = -\ln 2$ $\ln 2^{-1}$

j. $\ln e^{f(x)} = f(x)$

k. $\ln 2 = -\ln(\frac{1}{2})$ l. $\ln 10^3 = 3 \ln 10$

$\ln(\frac{1}{2})^{-1}$

5. Simplify.

a. $e^{\ln x} = \boxed{x}$

b. $\ln e^x = \boxed{x}$

c. $e^{-\ln x} = e^{\ln x^{-1}} = x^{-1} = \boxed{\frac{1}{x}}$

d. $\ln e^{-x^2} = \boxed{-x^2}$

e. $\ln e^{4x} = \boxed{4x}$

f. $\ln \frac{1}{e^x} = \ln e^{-x} = \boxed{-x}$

g. $e^{\ln 2 + \ln x} = e^{\ln 2} \cdot e^{\ln x} = \boxed{2x}$

h. $e^{2 \ln x} = e^{\ln x^2} = \boxed{x^2}$

i. $\ln(e^{x-x^2}) = \boxed{x-x^2}$

j. $e^{x+\ln x} = e^x \cdot e^{\ln x} = \boxed{x e^x}$

k. $\ln(x^2 e^{-2x}) = \ln x^2 + \ln e^{-2x} = \boxed{2 \ln x - 2x}$

l. $\frac{e^{\ln x - 2 \ln y}}{e^{2 \ln y}} = \frac{e^{\ln x}}{e^{\ln y^2}} = \boxed{\frac{x}{y^2}}$

6. Solve for y.

a. $e^{\sqrt{y}} = x^2$
 $\sqrt{y} \cdot \ln e = 2 \ln x$
 $y = \boxed{(2 \ln x)^2}$

b. $e^{2y} = x^2$
 $2y \cdot \ln e = 2 \ln x$
 $y = \boxed{\ln x}$

c. $e^{x^2} \cdot e^{2x+1} = e^y$
 $e^{x^2+2x+1} = e^y$
 $y = x^2+2x+1 = \boxed{(x+1)^2}$

d. $\ln(y-1) = x + \ln x$
 $e^{\ln(y-1)} = e^x \cdot e^{\ln x}$
 $y-1 = x e^x$
 $y = \boxed{x e^x + 1}$

e. $\ln(y-2) = \ln(\sin x) - x$
 $e^{\ln(y-2)} = \frac{e^{\ln \sin x}}{e^x}$
 $y-2 = \frac{\sin x}{e^x}$
 $y = \boxed{\frac{\sin x}{e^x} + 2}$

f. $\ln(y^2-1) - \ln(y+1) = \sin x$
 $\ln\left(\frac{y^2-1}{y+1}\right) = \sin x$
 $\ln\left(\frac{(y+1)(y-1)}{y+1}\right) = \sin x$
 $\ln(y-1) = \sin x$
 $e^{\ln(y-1)} = e^{\sin x}$
 $y-1 = e^{\sin x}$
 $y = \boxed{e^{\sin x} + 1}$