For positive real numbers a, b and x with $a \neq 1$ and $b \neq 1$

$$\log_b x = \frac{\log_a x}{\log_a x} = \frac{\ln x}{\ln x}$$

Rewrite the following as an exponential function then solve for y

A) $y = \log_4 7$

$4^y = 7$

Change of Base

$\frac{\log 7}{\log 4} = \frac{\ln 7}{\ln 4}$

1.40 1.40

Use the change of base formula and your calculator to evaluate the logarithm

$3^x = 16$ $\left(\frac{1}{2}\right)^x = 2$

A) $\log_3 16$

$\frac{\ln 16}{\ln 3} = 2.52$

B) $\log_{1/2} 2$

$\frac{\ln 2}{\ln \frac{1}{2}} = -1$

Express using only natural logarithms

A) $g(x) = \log_5 x$

$g(x) = \frac{\ln x}{\ln 5}$

B) $g(x) = \log_2(x+y)$

$g(x) = \frac{\ln(x+y)}{\ln 2}$

Describe the transformation of each function from the original function ln(x) or log(x)

42) $f(x) = \ln(x) + 2$

up 2

44) $f(x) = \ln(-x) + 2$

Reflect over y

up 2

46) $f(x) = \ln(5 - x)$

$\ln(-x+5)$

$\ln -(x-5)$

Reflect over y-axis

Right 5

A) $f(x) = \ln(x - 5)$

Right 5

52) $f(x) = -3\log(1-x) + 1$

$-3\log(-x+1) + 1$

$-3\log -(x-1) + 1$

Reflection over x + y axis

Vertical Stretch by factor of 3

Right 1

up 1

B) $y = \frac{1}{3}\log x$

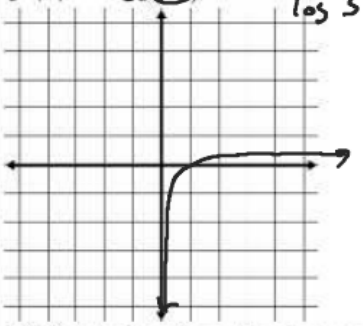
C) $y = \log(2x)$

D) $y = \log\left(\frac{1}{2}x\right)$

$5x = 0$
$x = 0$

Sketch a graph of the following functions

$f(x) = \log_3(5x) = \frac{\log 5x}{\log 3}$



1) Determine the vertical asymptotes

$x = 0$

2) Determine the x-intercept

$\left(\frac{1}{5}, 0\right)$

3) Determine the domain and range

D: $(0, \infty)$

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

4) Intervals of Increase or Decrease

Inc $(0, \infty)$

5) Determine the end behavior

$\lim_{x \to \infty} f(x) = \infty$ $\lim_{x \to 0} f(x) = -\infty$

6) Intervals of Concavity

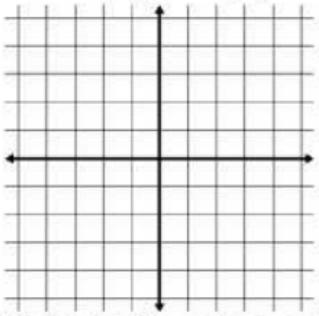
Down $(0, \infty)$

$0 = \log_3 5x$

$3^0 = 5x$

$1 = 5x$

$f(x) = \ln(x^4) = 4\ln x$



1) Determine the vertical asymptotes

2) Determine the x-intercept

3) Determine the domain and range

4) Intervals of Increase or Decrease

5) Determine the end behavior

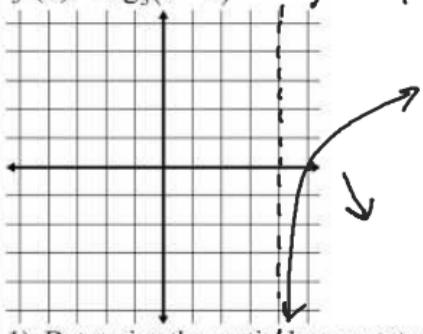
6) Intervals of Concavity

$x-4=0$

$\ln(-x+4)$

Sketch a graph of the following functions

$f(x)=\log_3(x-4)$ Right 4



1) Determine the vertical asymptotes

2) Determine the x-intercept

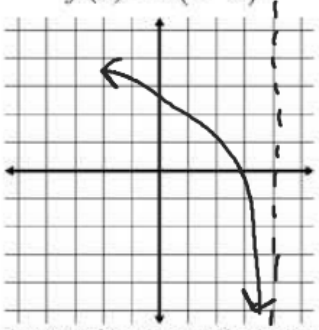
3) Determine the domain and range

4) Intervals of Increase or Decrease

5) Determine the end behavior

6) Intervals of Concavity

$f(x)=\ln(4-x)$ $\ln-(x-4)$



1) Determine the vertical asymptotes

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What you'll Learn About

Find the exact solution algebraically, and check it by substituting into the original equation.

A) $\left(\frac{1}{4}\right)^x = \frac{1}{16}$

$\left(\frac{1}{4}\right)^x = \frac{1}{4^2}$

$x = 2$

B) $20\left(\frac{1}{2}\right)^{x/3} = 5$

$\frac{20}{20}$

$\frac{1}{2}^{x/3} = \frac{1}{4}$

$\left(\frac{1}{2}\right)^{x/3} = \left(\frac{1}{2}\right)^2$ $\frac{x}{3} = 2$

$x = 6$

C) $2(3)^{x/2} = 6$

D) $2(3)^{-x/2} = 54$

E) $\log x = 5$

F) $\log_2(x-4) = 3$