

MAT1375, Classwork14, Fall2026

Ch13. Exponential and Logarithmic Functions II

$$\ln : \log_e$$

1. Rewrite the equation in its equivalent exponential form.

a) $x = \log_2(16)$.

$$2^x = 16$$

$$\Rightarrow x = 4$$

b) $2 = \log_5 x$.

$$5^2 = x$$

$$\Rightarrow x = 25$$

c) $x = \log_{13}(1)$.

$$13^x = 1$$

$$x = 0$$

d) $x = \ln(e^7) = \log_e(e^7)$

$$e^x = e^7$$

$$\Rightarrow x = 7$$

2. Evaluate the expression by rewriting it as an exponential expression.

a) $\log_5(125)$.

a) Let $x = \log_5(125)$

$$5^x = 125$$

$$x = 3$$

b) $\log_4(1)$.

b) $y = \log_4(1)$

$$4^y = 1$$

$$y = 0$$

c) $\log_7\left(\frac{1}{49}\right)$.

d) $\log_2(\sqrt[5]{2})$.

c) $x = \log_7\left(\frac{1}{49}\right)$

$$7^x = \frac{1}{49} = \frac{1}{7^2} = 7^{-2}$$

$$x = -2$$

e) $\log_{25}(5)$.

d) $x = \log_{12}(\sqrt[5]{2})$

$$2^x = \sqrt[5]{2} = 2^{\frac{1}{5}}$$

$$x = \frac{1}{5}$$

$$x = \log_{25}(5)$$

$$25^x = 5 = (25)^{\frac{1}{2}}$$

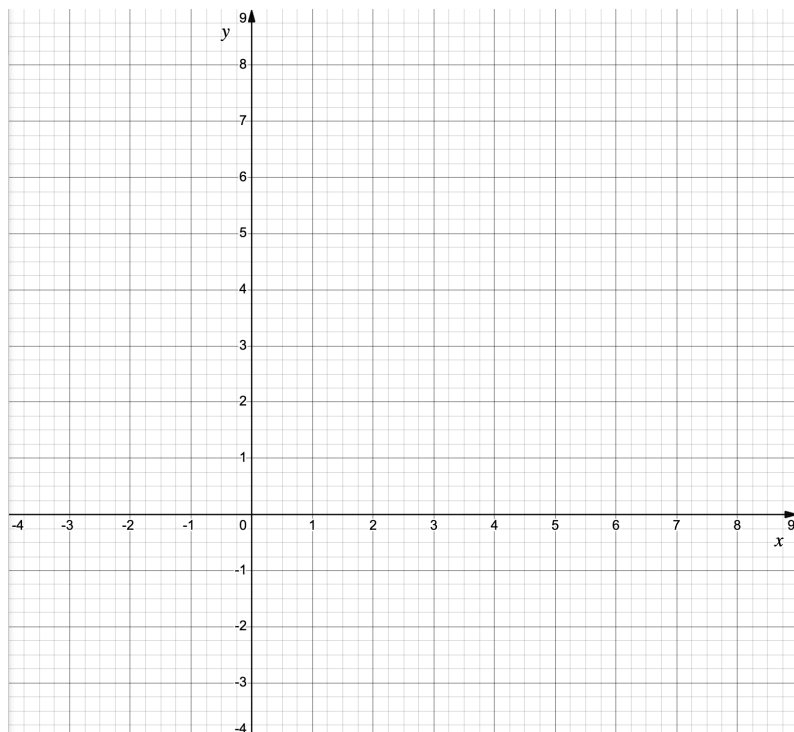
$$x = \frac{1}{2}$$

3. Graph $f(x) = 3^x$ and $g(x) = \log_3 x$ in the same coordinate.

$$y = 3^x \Rightarrow x = 3^y \Rightarrow \log_3(x) = y \Rightarrow f^{-1}(x) = \log_3(x)$$

x	-3	-2	-1	0	1	2
$f(x)$						

x						
$g(x)$	-3	-2	-1	0	1	2



$$-3 = \log_3 x \Rightarrow x = \underline{\hspace{2cm}}$$

$$-2 = \log_3 x \Rightarrow x = \underline{\hspace{2cm}}$$

$$-1 = \log_3 x \Rightarrow x = \underline{\hspace{2cm}}$$

$$0 = \log_3 x \Rightarrow x = \underline{\hspace{2cm}}$$

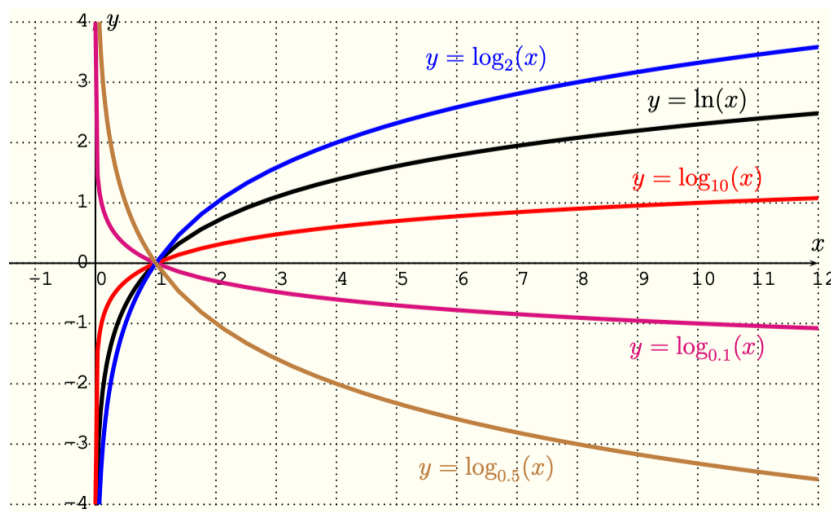
$$1 = \log_3 x \Rightarrow x = \underline{\hspace{2cm}}$$

$$2 = \log_3 x \Rightarrow x = \underline{\hspace{2cm}}$$

4. Characteristics of Exponential Function of $g(x) = \log_b x$.

(a) The domain of g : _____; The range of g : _____.

(b) There is _____ y -intercept. In fact, g approaches, but never touches _____ which is a _____ asymptote of g .



(c) Its x -intercept is _____.

(d) For $b > 1$, $g(x) \rightarrow$ _____ as $x \rightarrow \infty$, $g(x) \rightarrow$ _____ as $x \rightarrow 0^+$.

(e) For $0 < b < 1$, $g(x) \rightarrow$ _____ as $x \rightarrow \infty$, $g(x) \rightarrow$ _____ as $x \rightarrow 0^+$.

5. **Basic logarithmic evaluations:** Let $f(x) = b^x$ and $g(x) = \log_b x$, $b > 0$, $b \neq 1$. We have

(1) Elementary logarithms: $b = b^1 \Leftrightarrow$ _____ $= \log_b(b)$.

$$1 = b^0 \Leftrightarrow \text{_____} = \log_b(1).$$

(2) Inverse properties: _____ $= x$. ($f(g(x)) = x$)

$$\text{_____} = x. (g(f(x)) = x)$$

(3) Change-of-Base property: **10-base:** $\log_b(x) = \frac{\log_{10}(x)}{\log_{10}(b)} = \frac{\log(x)}{\log(b)}.$

$$\text{natural base: } \log_b(x) = \frac{\log_e(x)}{\log_e(b)} = \frac{\ln(x)}{\ln(b)}.$$

6. Given $f_1(x) = \log_e(x)$, $f_2(x) = \log_{0.5}(x)$, $f_3(x) = \log_{10}(x)$, $f_4(x) = \log_2(x)$, and $f_5(x) = \log_{0.1}(x)$. Using the following numbers to find the order of these five functions from small to larger for a fixed $x > 1$:

$$\ln(2) = 0.6931, \ln(10) = 2.3026, \ln(0.1) = -2.3026, \ln(0.5) = -0.6931.$$