

MAT 1275, Classwork22, Fall2024

ID: _____

Name: _____

1. Definition of the Exponential Function:

A function f is called exponential function with base b for any real number x if

$$f(x) = c \cdot b^x,$$

for some real number c and positive real number b which is called the base.

2. Please circle the given function if it is an exponential function:

- (1) $f(x) = 2^x$. (2) $g(x) = 3^{x+1}$. (3) $h(x) = e^x$. (4) $k(x) = \left(\frac{1}{5}\right)^x$. (5) $l(x) = x^2$ polynomial
 (6) $m(x) = (-1)^x$. (7) $n(x) = x^x$.

2 extra) $2^x = 4, x = 2$; $3^x = \frac{1}{9} = 3^{-2} \Rightarrow x = -2$

3. Definition of Logarithmic Function:

For $x > 0$ and $b > 0, b \neq 1$, the logarithmic of x with base b is defined by the equivalence

exponential world
 $x = b^y$ \Leftrightarrow $y = \log_b(x)$.
base log world

$2^x = 4 \Leftrightarrow x = \log_2 4$

4. Rewrite the equation as a logarithmic equation.

a) $3^4 = x$. $\Rightarrow 4 = \log_3(x)$
 b) $e^x = 17$. $\Rightarrow x = \log_e(17)$
 c) $2^{7a} = 53$. $\Rightarrow 7a = \log_2(53)$
 $\Rightarrow a = \frac{\log_2(53)}{7}$
 d) $b^3 = 8$. $\Rightarrow 3 = \log_b(8)$
(b = 2)

5. Rewrite the equation in its equivalent exponential form.

"ln" = "log_e"

a) $x = \log_2(16)$

$$2^x = 16$$

$$(x=4)$$

b) $2 = \log_5 x$

$$5^2 = x$$

$$(x=25)$$

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

$$13^x = 1$$

$$x=0$$

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

$$e^x = e^7$$

$$x=7$$

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

a) $\log_5(125)$

b) $\log_4(1)$

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

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

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

a) $x = \log_5(125)$

$$5^x = 125$$

$$x=3$$

b) $x = \log_4(1)$

$$4^x = 1$$

$$\Rightarrow x=0$$

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

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

$$\Rightarrow x = -2$$

$$\Rightarrow \log_5(125) = 3$$

$$\Rightarrow \log_4(1) = 0$$

$$\Rightarrow \log_7\left(\frac{1}{49}\right) = -2$$

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

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

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

$$\log_2(\sqrt[5]{2}) = \frac{1}{5}$$

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

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

$$\sqrt{25} = 5$$

$$25^{\frac{1}{2}}$$

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

