

CHAPTER 3 REVIEW ☺

For #1 - #6 use $f(x) = \ln(x^2)$

1) $f(-1) = 0$ ----- True or False

2) $f(x \div 2) = f(x) - f(-2)$ ----- True or False

3) $f(a+x) = f(a) \cdot f(x)$ given that $a < x < 0$ ----- True or False

4) $-\sqrt{f(x)} = \frac{1}{2}f\left(\frac{1}{x}\right)$ ----- True or False

5) If $\frac{1}{2}f(u) = f(v)$, then $\sqrt{u} = v$ is the only solution for v ----- True or False

6) if $e^{4x} + e^{2x} - 7 = 13$, then $x = \ln 2$ ----- True or False

MULTIPLE CHOICE:

7) Which of the following are equivalent?

i. $\log_3\left(\frac{81}{27}\right)$

ii. $-\log_3 27 + \log_3 81$

iii. $\log_3 81 \div \log_3 27$

A. i & ii

B. i & iii

C. ii & iii

D. None of them

E. All of them

8) Which of the following are equivalent?

i. $\frac{1}{2} + \log 3$

ii. $\frac{1}{2} \log 90$

iii. $\log(3\sqrt{10})$

A. i & ii

B. i & iii

C. ii & iii

D. None of them

E. All of them

9) Which of the following is equivalent to $\frac{\log 27}{\log 81}$?

A. $\log \frac{1}{3}$

B. $\frac{1}{3}$

C. $\log 27 - \log 81$

D. $\frac{3}{4}$

E. Cannot determine without calculator

10) Which of the following is the value of $-\log 0.00001$?

A. -5

B. -4

C. $\frac{1}{4}$

D. $\frac{1}{5}$

E. None of these

11) Which of the following is the value of $\log_4 \frac{4}{\sqrt[6]{64}}$?

A. $-\frac{1}{2}$

B. $\frac{1}{2}$

C. $\frac{1}{3}$

D. $-\frac{1}{3}$

E. None of these

12) Which of the following is the value of $-\log_{\frac{1}{3}} 243$?

A. $-\frac{1}{5}$

B. -5

C. 5

D. $\frac{1}{5}$

E. None of these

13) Given that $\log_{\sqrt[3]{64}} x = \frac{5}{3}$, what is the value of x ?

A. 81

B. $\frac{3}{2}$

C. 9

D. 36

E. None of these

14) The exponential form of $\log_{\frac{1}{2}} x = 5$ is which of the following?

A. $5^5 = x$

B. $5^x = \frac{1}{2}$

C. $x^{\frac{1}{2}} = 5$

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

E. None of these

15) Given that $\log 4 = a$, $\log 7 = b$, & $\log 2 = c$ which of the following is equivalent to $\log_7 4$?

A. $\frac{b}{a}$

B. $\frac{a}{b}$

C. $\log\left(\frac{a}{b}\right)$

D. $\log_b a$

E. None of these

$$\frac{1}{2} \ln u^2 = \ln v^2$$

$$\ln u = \ln v^2$$

$$u = v^2$$

$$v = \pm \sqrt{u}$$

$$\frac{1}{2} \log 9 + \frac{1}{2} \log 10$$

$$\log 3 + \log 10^{\frac{1}{2}}$$

$$81^x = 27$$

$$3^{4x} = 3^3$$

$$-\log_{10} \frac{1}{100000}$$

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

$$\frac{1}{3}^x = \frac{1}{243}$$

$$(64^{\frac{1}{3}})^{\frac{2}{3}} = x$$

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

#16-2: Show ALL work. Do NOT SKIP steps on this question. I MUST be able to follow your work.

$$16) \left(\frac{1}{4}\right)^{7x+1} \cdot 8^{2x+1.5} = \sqrt{\frac{1}{2}}$$

$$(2^{-1})^{7x+1} (2^3)^{2x+1.5} = 2^{-\frac{1}{2}}$$

$$-14x - 2 + 6x + 4.5 = -\frac{1}{2}$$

$$-8x = -3$$

$$x = \frac{3}{8}$$

$$17) \log(x-5) + \log(x+2) = \log(38 - 3x^2 + 2x)$$

$$\log(x^2 - 3x - 10) = \log(-3x^2 + 2x + 38)$$

$$x^2 - 3x - 10 = -3x^2 + 2x + 38$$

$$4x^2 - 5x - 48 = 0$$

$$x = \frac{-5 \pm \sqrt{25 - 4(4)(-48)}}{2(4)}$$

$$x = \frac{5 \pm 28}{8} \quad \begin{matrix} -\frac{23}{8} = -2\frac{7}{8} \\ \frac{33}{8} = 4\frac{1}{8} \end{matrix} \quad \text{No Solution}$$

$$19) -3e^{2x} - 6e^x = -189$$

$$e^{2x} + 2e^x = 63$$

$$e^{2x} + 2e^x - 63 = 0$$

$$(e^x + 9)(e^x - 7) = 0$$

$$e^x = -9 \quad e^x = 7$$

$$\ln 7 = x$$

$$20) \log_2 x^4 = -8$$

$$(e^{-2}) = (x^4)^{\frac{1}{2}}$$

$$e^{-2} = x$$

21) A rumor spreads through a track team according to the model $R(t) = 162(1 - 3^{-t})$ where t is the number of hours since the rumor was started and $R(t)$ is the number of people who have heard the rumor. How many hours will it take for 160 people to hear the rumor?

$$\frac{160}{162} = \frac{162(1 - 3^{-t})}{162}$$

$$3^{-t} = \frac{1}{81}$$

$$\frac{160}{162} = 1 - 3^{-t}$$

$$\log_3 \left(\frac{1}{81}\right) = -t$$

$$-\frac{2}{162} = -3^{-t}$$

$$-\log_3 \frac{1}{81} = t$$

$$t = 4$$

$$22) \text{ Evaluate: } \frac{1}{3} \log_3 27 - 5 \log_3 2 + \frac{1}{2} \log_3 16 - 3 \log_3 \left(\frac{1}{2}\right)$$

$$\log_3 27 - \log_3 2^5 + \log_3 \sqrt{16} - \log_3 \left(\frac{1}{2}\right)^3$$

$$\log_3 3 - \log_3 32 + \log_3 4 - \log_3 \frac{1}{8}$$

$$\log_3 \frac{3.4}{32 \cdot \frac{1}{8}}$$

$$\log_3 \frac{3.4}{4}$$

$$\log_3 3$$

$$\textcircled{1}$$

1. If \$1000 is invested at an interest rate of 7%, compounded continuously, determine the balance in the account after 5 years. Use the formula $A = Pe^{rt}$. $A = 1000e^{0.35}$

[A] \$7389.06 [B] \$1521.96 [C] \$1402.55 [D] \$1419.07

2. Write an exponential function to model the situation. Then predict the value of the function after 5 years (to the nearest whole number). A population of 350 animals that decreases at an annual rate of 11%.

[A] $f(x) = 350(0.89)^x$; 1558

[B] $f(x) = 350(1.11)^x$; 590

[C] $f(x) = 350(1.11)^x$; 1943

[D] $f(x) = 350(0.89)^x$; 195

3. Find the exact value of $\ln e^8$.

[A] $\frac{1}{8}$

[B] $8e$

[C] $\frac{1}{8e}$

[D] 8

4. Find the value of $\log 0.00001$.

$\frac{1}{100,000} \log 10^{-5} = -5$

5. Solve for x .

[A] $x = 2.6$

[B] $x = 1.41$

[C] $x = 2.30$

[D] $x = 0.96$

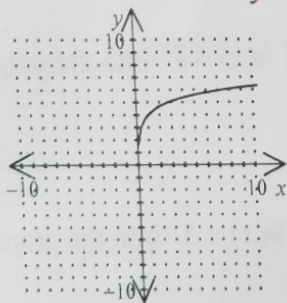
$10^x = 26$

$\log_{10} 26 = x$

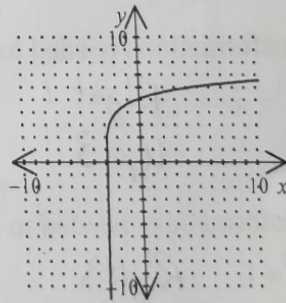
6. Which is the graph of $f(x) = 4 + \ln(x + 3)$?

$f(x) = \ln(x + 3) + 4$

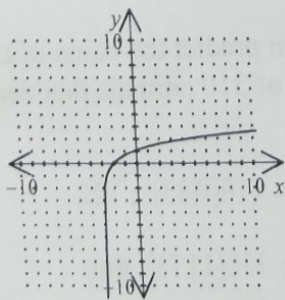
[A]



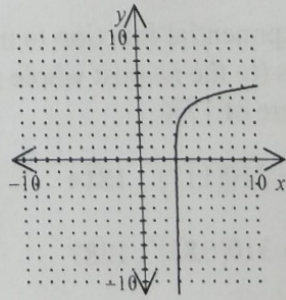
[B]



[C]



[D]



$$\log x^5 + \log(x-4)^3$$

7. Which is $5 \log x + 3 \log(x-4)$ written as a single logarithm?

- [A] $\log x^5(x-4)^3$ [B] $15 \log x(x-4)$ [C] $\log x(x-4)$ [D] none of these

8. Given $\log 9 = 0.954$ and $\log 8 = 0.903$, find $\log \frac{9}{8}$. $\log 9 - \log 8 = .954 - .903$

$$0.051$$

9. Which is the solution to $8^x = 3^{x+2}$?

$$x = \frac{2 \log 3}{1 - \log 3}$$

- [A] $x = 1.2000$ [B] $x = 1.1201$ [C] $x = 2.2402$ [D] none of these

10. Which is the solution to $9^x = 8^{x-4}$?

$$x = \frac{-4}{\log_8 9 - 1}$$

- [A] $x = -70.6194$ [B] $x = -32.0000$ [C] $x = -35.3097$ [D] none of these

11. Which is the solution to $7^x = 8^{x+6}$?

$$x = \frac{6}{\log_7 8 - 1}$$

- [A] $x = -46.7180$ [B] $x = -93.4361$ [C] $x = 3.0995$ [D] none of these

12. The number of bacteria present in a culture after t minutes is given as $B = 10e^{kt}$, where k is a constant. If there are 1194 bacteria present after 3 minutes, find k .

$$k = \frac{\ln 119.4}{3}$$

- [A] 14.347 [B] 4.782 [C] 1.594 [D] 2.391

13. List the transformations needed to transform the graph of $h(x) = 8^x$ into the graph of $f(x) = 8^{x-1} + 3$.

Right 1
up 3

14. List the transformations needed to transform the graph of $h(x) = 3^x$ into the graph of $f(x) = 3^{x-3} + 1$.

Right 3
up 1

15. Write an exponential function to model the situation. Then predict the value of the function after 5 years (to the nearest whole number). A population of 310 animals that decreases at an annual rate of 17%.

[A] $f(x) = 310(1.17)^x$; 1814

[B] $f(x) = 310(0.83)^x$; 122

[C] $f(x) = 310(0.83)^x$; 1287

[D] $f(x) = 310(1.17)^x$; 680

16. Cheryl invests \$250 at 9% compounded continuously.

a. Write an exponential function to model the situation.

b. At what time will the total reach \$500?

$$\frac{500}{250} = \frac{250e^{.09t}}{250}$$

$$e^{.09t} = 2$$

$$.09t = \ln 2$$

$$t = \frac{\ln 2}{.09}$$

$$P(t) = 250e^{.09t}$$

17. Describe the transformation from $f(x) = \log x$ to $g(x) = \log(x - 2) + 4$. Find the domain and range of the function $g(x)$.

$\rightarrow 2 \uparrow 4$

$$D: (2, \infty)$$

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