

# 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

$(e^{2x} + 5)(e^{2x} - 4) = 0$

$e^{2x} = 4$   
 $2x \ln e = \ln 4$

**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.  $\frac{1}{2} + \log_3 9$

ii.  $\frac{1}{2} \log_3 90$

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

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

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  $\frac{\log 27}{\log 81}$ ?

$\log_{81} 27$

$81^x = 27$

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

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

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

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

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

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

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

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

A. 81

B.  $3/2$

C. 9

D. 36

E. None of these

$(64^{\frac{1}{3}})^{\frac{5}{3}} = x$

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

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

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

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

$$16) \left(\frac{1}{4}\right)^{7x+1} \cdot 8^{2x+15} = \sqrt{\frac{1}{2}}$$

$$\left(2^{-2}\right)^{7x+1} \left(2^3\right)^{2x+15} = 2^{-\frac{1}{2}}$$

$$-14x - 2 + 6x + 45 = -\frac{1}{2}$$

$$-8x = -3$$

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

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

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

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

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

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

$$x = \frac{5 \pm 20}{8} \quad \left\{ \begin{array}{l} \frac{-23}{8} = -2\frac{7}{8} \\ \frac{27}{8} = 4\frac{1}{8} \end{array} \right. \quad \text{No Solution}$$

$$19) \frac{-3e^{2x} - 6e^x}{-5} = \frac{-189}{-3}$$

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

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

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

$$e^x = 7$$

$$\boxed{\ln 7 = x}$$

$$20) \log_3 x^4 = -8$$

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

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

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?

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

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

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

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

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

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

$$t = 4$$

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

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

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

$$\log_3 \frac{3 \cdot 4}{32 \cdot 8}$$

$$\log_3 \frac{3 \cdot 4}{4}$$

$$\log_3 3$$

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

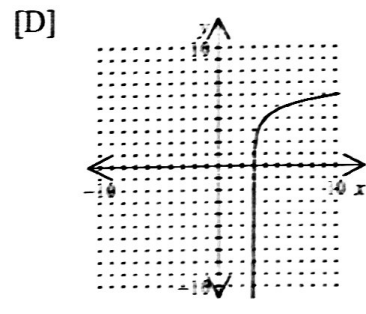
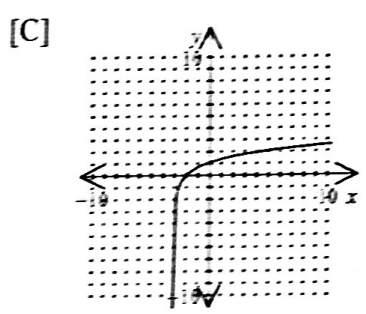
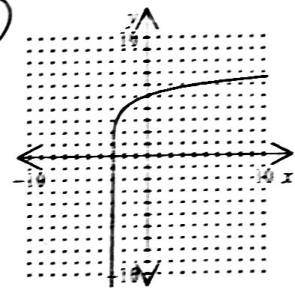
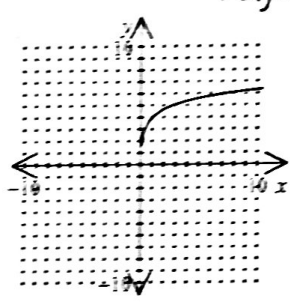
3. Find the exact value of  $\ln e^8$ .      [A]  $\frac{1}{8}$       [B]  $8e$       [C]  $\frac{1}{8e}$       [D] 8

4. Find the value of  $\log 0.00001$ .  $\frac{1}{100,000}$   $\log 10^{-5} = -5$

5. Solve for  $x$ .  $10^x = 26$       [A]  $x = 2.6$       [B]  $x = 1.41$       [C]  $x = 2.30$       [D]  $x = 0.96$   
 $\log_{10} 26 = x$

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

[A]      [B]  $f(x) = \ln(x+3) + 4$



$$\log x^5 + \log_2(x-4)^3$$

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  $\log \frac{9}{8}$ .  $\therefore \log 9 - \log 8 : .954 - .903$

$$0.051$$

$$\log_8 3^{x+2} = x$$

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

$$x = \frac{2 \log_8 3}{1 - \log_8 3}$$

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

x

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

$$x = \frac{-4}{\log_9 8 - 1}$$

- [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

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

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  $k$ .

- [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

$$f(x) = 8^{x-1} + 3. \quad \text{Right 1} \\ \text{up 3}$$

14. List the transformations needed to transform the graph of  $h(x) = 3^x$  into the graph of

$$f(x) = 3^{x-3} + 1. \quad \text{Right 3} \\ \text{up 1}$$

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.

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

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

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

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

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

$$.09t = \ln 2$$

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

$\rightarrow 2 \uparrow 4$

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

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