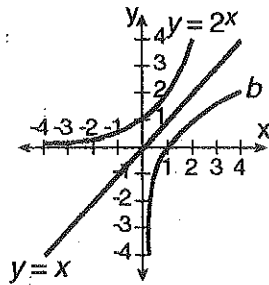


- 1) In the diagram below, figure  $b$  is the reflection of  $y = 2^x$  in the line  $y = x$ .



Which is an expression for the equation of figure  $b$ ?

- A)  $y = 2^{-x}$                       C)  $y = \log_2 x$   
 B)  $y = \log_x 2$                       D)  $y = (-2)^x$
- 2) The graph of  $y = \log x$  lies in Quadrants  
 A) I and IV                      C) I and II  
 B) III and IV                      D) II and III
- 3) What is the x-intercept of the graph of the equation  $y = \log_2 x$ ?  
 A) 0                      B) 1                      C) 4                      D) 2

- 4) The expression  $\log \frac{\sqrt[4]{a^2}}{\sqrt[3]{b}}$  is equivalent to  
 A)  $\frac{1}{4} \log a$                       C)  $4(\log a^2 - \log b)$   
 B)  $\frac{1}{2}(4 \log a - \log b)$                       D)  $\frac{1}{4}(2 \log a - \log b)$

- 5) The expression  $\frac{1}{3} \log(a) - 3 \log(b)$  is equivalent to  
 A)  $\log \frac{\sqrt[3]{a}}{b^3}$                       C)  $\log(\sqrt[3]{a} - b^3)$   
 B)  $\log \frac{\sqrt[3]{a}}{3b}$                       D)  $\log \frac{a}{3b^3}$

- 6) If  $\log 5 = a$ , then  $\log 0.0005$  is  
 A)  $4 - a$                       C)  $a - 3$   
 B)  $3 - a$                       D)  $a - 4$

7) Which of the following statements are true?

I.  $\log \left(\frac{28}{7}\right) = \frac{\log 28}{\log 7}$

II.  $\log \left(\frac{28}{7}\right) = \log 28 - \log 7$

III.  $\log \left(\frac{28}{7}\right) = \log 4$

IV.  $\log \left(\frac{28}{7}\right) = \frac{1}{7} \log 28$

- A) II, only                      C) I and II, only  
 B) I, II, and III, only                      D) II and III, only

8) If  $\log_2(x^2 - 1) = \log_2 8$ , then the solution set for  $x$  is

- A) {3}                      C) {-3}  
 B) {3, -3}                      D) {}

9) Solve for  $x$ :  $\log(10 - 3x) - 2 \log x = 0$

- A) 5, only                      C) 2, only  
 B) {-2, 5}                      D) {-5, 2}

10) Solve for  $x$ :  $\log 16 = 2 \log x$

- A) 1                      B) 8                      C) 3                      D) 4

11) Which of the following equations is equivalent to  $x \log 3 + 7 \log 3 = 3 \log 5$ ?

- A)  $3^{7x} = 5^3$                       C)  $3^{x+7} = 5^3$   
 B)  $3x + 21 = 15$                       D)  $(x + 7)^3 = 125$

12) Solve for  $x$ :  $\log_2(x - 3) + \log_2(x + 1) = 5$

- A) 7, only                      C) {-5, 7}  
 B) 5, only                      D) {-7, 5}

13) Solve for  $x$ :  $\log(x - 3) = (\log x - \log 2)$

- A)  $\frac{3 + \sqrt{11}}{2}$                       C)  $\frac{5}{2}$   
 B) 6                      D) (2, 1)

14) Solve:  $\log_2(x^2 - 2x + 5) = 2$

15) Find the value of  $\log_{10} 10,000$ .

16) Solve  $x$ :  $\log_{\sqrt{2}} 4 = x$

17) If  $\log_x 5 = \frac{1}{2}$ , find the value of  $x$ .

18) If  $\log_{(x+1)} 27 = 3$ , find the value of  $x$ .

19) The graphs of  $y = \log_2 x$  and  $y = 2^x$  are symmetrical to each other with respect to a line. What is an equation of the line of symmetry?

20) Write an equation of the inverse of the function  $y = \log_2 x$ .

*\* Reminder: Show work!*

**CHECK ANSWERS#1-20**

A A A B B B

C C C D D D D

1 2 4 4 25

$y = 2^x$                        $y = x$

Reminder: Show work!

- 21) If  $\log 2 = a$  and  $\log 3 = b$ , express  $\log 6$  in terms of  $a$  and  $b$ .
- 22) If  $\log 2 = a$  and  $\log 3 = b$ , express  $\log 18$  in terms of  $a$  and  $b$ .
- 23) If  $\log 2 = a$  and  $\log 3 = b$ , express  $\log 36$  in terms of  $a$  and  $b$ .
- 24) If  $\log 2 = a$  and  $\log 3 = b$ , express  $\log \sqrt{6}$  in terms of  $a$  and  $b$ .
- 25) If  $\log 2 = a$  and  $\log 3 = b$ , express  $\log 200$  in terms of  $a$  and  $b$ .
- 26) The amount of money  $A$  after  $t$  years that principal  $P$  will become if it is invested at rate  $r$  compounded  $n$  times a year is given by the relationship  $A(t) = P(1 + \frac{r}{n})^{nt}$  where  $r$  is expressed as a decimal. To the nearest tenth, how long will it take \$5,300 to become \$7,000 if it is invested at 9% and is compounded quarterly?

- 27) During surgery, a patient must have *at least* 40 mg of an antibiotic in his system. The amount of antibiotic present  $k$  hours after administration of 100 mg of this antibiotic is given by  $P(k) = 100(.508)^k$ . After how many hours (to the nearest tenth) will the nurse have to administer another dose of the antibiotic to keep the level of antibiotic high enough?
- 28) The growth of a certain strain of bacteria is given by the equation  $C = I(2.4)^{0.621t}$ , where  $C$  is the final number of bacteria,  $I$  is the initial number of bacteria, and  $t$  is the number of hours. If the initial number of bacteria was 7, find the numbers of hours required for the colony to reach 3200 bacteria. [Round the answer to the nearest tenth of an hour.]

**CALCULATOR OK FOR #26,27,28**

**CHECK ANSWERS#21-28**

1.4	3.1	11.3	$\frac{a+b}{2}$
$a + 2$	$a + 2b$	$a + b$	$2a + 2b$

Simplify without using a calculator. Clearly show all steps.

- |                                      |                              |                          |                   |
|--------------------------------------|------------------------------|--------------------------|-------------------|
| 29. $\log 10$                        | 30. $\log 1$                 | 31. $\ln e$              | 32. $\ln 1$       |
| 33. $\ln e^3 - \ln e^7$              | 34. $2\ln e^4$               | 35. $\ln e^6 - 2\ln e^5$ | 36. $\ln e^{e^2}$ |
| 37. $\ln \sqrt[3]{e^3} + \ln e^{-2}$ | 38. $\ln \frac{1}{\sqrt{e}}$ | 39. $-1 + \ln e^{2x}$    |                   |

Solve for  $x$  without using a calculator. Clearly show all steps.

- |                       |                          |                                     |
|-----------------------|--------------------------|-------------------------------------|
| 40. $\sqrt{2^x} = 32$ | 41. $\ln x - \ln 3 = 0$  | 42. $(\frac{1}{3})^x = 9$           |
| 43. $e^x = 7$         | 44. $\log x = -1$        | 45. $\ln x = -3$                    |
| 46. $4 + 2\ln x = 5$  | 47. $\ln \sqrt{x+2} = 1$ | 48. $\ln(x-2) + \ln(2x-3) = 2\ln x$ |

Show work!

<b><u>CHECK ANSWERS#29-39</u></b>	-4	-4	- $\frac{7}{5}$	- $\frac{1}{2}$	0	0	1	1	8	x <sup>2</sup>	2x-1
<b><u>CHECK ANSWERS#40-48</u></b>	-2	$\frac{1}{10}$	3	6	10	ln7	$\sqrt{e}$	$\frac{1}{e^3}$	$e^2 - 2$		