Math 30-1: Exponential and Logarithmic Functions
PRACTICE EXAM

1. All of the following are exponential functions except:

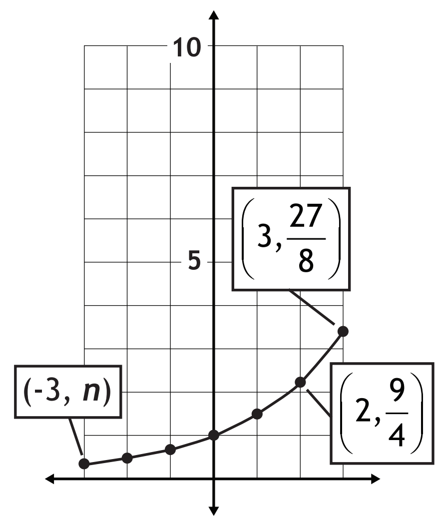
A. $y = \left(\frac{1}{2}\right)^x$

B. $y = 1^x$

C. $y = 2^x$

D. $y = 3^x$

2. The point (-3, n) exists on the exponential graph shown. The value of n is:



A. $-\frac{8}{27}$

B. $\frac{8}{27}$

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

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

3. The graph of $y = \left(\frac{1}{2}\right)^{x+3} - 2$ has:

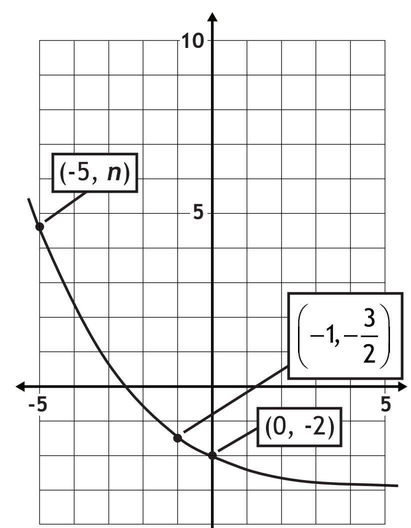
A. A vertical asymptote at x = -3

B. A horizontal asymptote at x = -3

C. A vertical asymptote at y = -2

D. A horizontal asymptote at y = -2

4. The point (-5, n) exists on the exponential graph shown. If the function has the form $y = ab^x + k$, the value of n is:



A. $\frac{16}{81}$

B. $\frac{81}{16}$

C. $\frac{32}{147}$

D. $\frac{147}{32}$

5. If the graph of $y = \left(\frac{1}{3}\right)^x$ is stretched vertically so it passes through the point $\left(2, \frac{1}{12}\right)$, the equation of the transformed graph is:

A. $y = \frac{3}{4}\left(\frac{1}{3}\right)^x$

B. $y = \frac{4}{3}\left(\frac{1}{3}\right)^x$

C. $y = \frac{3^{x+1}}{4}$

D. $y = 4(3)^{1-x}$

6. The function $y = 25(5)^x$ has the same graph as:

A. $y = 5^{x+2}$

B. $y = 5^{x+3}$

C. $y = \left(\frac{1}{5}\right)^{2x}$

D. $y = \left(\frac{1}{5}\right)^{3x}$

7. The solution of $x^{-\frac{3}{5}} = 27$ is:

A. $x = \frac{1}{243}$

B. $x = \frac{1}{81}$

C. $x = \frac{27}{81}$

D. $x = \frac{2}{3}$

8. If $27^{2m-n} = \frac{1}{9}$ and $49^{3m-2n} = 7$, the values of m and n are:

A. $m = -2;\ n = 1$

B. $m = 1;\ n = -2$

C. $m = -3;\ n = -\frac{11}{6}$

D. $m = -\frac{11}{6};\ n = -3$

9. The solution of $16^{3x} = \left(2^{5x+2}\right)\left(8^{2x}\right)$ is:

A. $x = 1$

B. $x = 2$

C. $x = 3$

D. $x = 4$

10. The solution of $5^{x} = 125\sqrt{5}$ is:

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

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

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

D. $x = \frac{7}{2}$

11. The solution of $4^{2x} - 6\left(4\right)^{x} + 8 = 0$ is:

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

B. $x = 1$

C. $x = \frac{1}{2}, 1$

D. $x = -\frac{1}{2}, 3$

12. The solution of $2^{x+3} + 2^{x+4} = 96$ is:

A. $x = 1$

B. $x = 2$

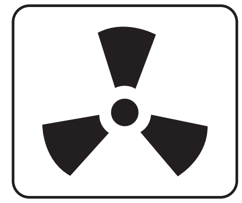
C. $x = 3$

D. $x = 4$

13. A 90 mg sample of a radioactive isotope has a half-life of 5 years. A function that relates the mass of the sample, m, to the elapsed time, t, is:

A. $m(t) = 5(90)^{\frac{t}{2}}$

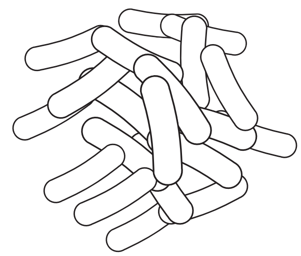
B. $m(t) = 90(5)^{t}$



C. $m(t) = 90\left(\frac{1}{2}\right)^{\frac{t}{5}}$

D. $m(t) = 5\left(\frac{1}{2}\right)^{\frac{t}{90}}$

14. A bacterial culture contains 800 bacteria initially and doubles every 90 minutes. The quantity of bacteria that exists in the culture after 8 hours is:



A. 851

B. 6400

C. 32254

D. 72000

15. A computer that cost $2500 in 1990 depreciated at a rate of 30% per year. How much was the computer worth four years after it was purchased?

A. $20.25

B. $187.5

C. $600

D. $750

16. $500 is placed in a savings account with an annual interest rate of 2.5%. The amount of the investment in 5 years if compounding occurs monthly is:

A. $565.70

B. $566.14

C. $566.50

D. $566.57

17. The equation $2 = \log_{x+1}(y+1)$ can be written as:

A. $y = \dfrac{2}{\log_{x+1}} - 2$

B. $y = (x+1)^2 - 1$

C. $y = 2(x+1) - 1$

D. $y = \log_{x+1} 2 - 1$

18. The product $(\log_a x)(\log_x b)$ can be written as:

A. $\log_a b$

B. $\log_b a$

C. $\log_{ax}(xb)$

D. $\log_a x + \log_x b$

19. The expression $\log 2 + \log x - \log(x+3)$ can be written as:

A. $\log 2 - \log 3$

B. $\log\left(\dfrac{3}{2}\right)$

C. $\log\left(\dfrac{2x}{x+3}\right)$

D. $\log\left(\dfrac{2+x}{3x}\right)$

20. The expression $\log_a\left(\sqrt{a}\right)^k$ can be written as:

A. $k\log_a\left(\dfrac{a}{2}\right)$

B. $2k$

C. $\dfrac{k}{2}\log_a\left(\dfrac{a}{2}\right)$

D. $\dfrac{k}{2}$

21. If $\log_b 4 = k$, then $\log_b 16$ is equivalent to:

A. $2k$

B. k^2

C. $4k$

D. k^4

22. The expression $3+\log_2 x$ can be written as the single logarithm:

A. $3\log_2 x$

B. $\log_2 x^3$

C. $\log_2 (8x)$

D. $\log_2 (9x)$

23. The equation $3^x = 4$ has the solution:

A. $x = \frac{4}{3}$

B. $x = \log_3 4$

C. $x = \log_4 3$

D. $x = \log\left(\frac{4}{3}\right)$

24. The equation $2\times 5^{x+2} = 7$ has the solution:

A. $x = 1$

B. $x = \log_5\left(\frac{7}{2}\right)$

C. $x = \log_5\left(\frac{7}{2}\right) - 2$

D. $x = \log_7\left(\frac{5}{2}\right) - 2$

25. The equation $2^{x+3} = 3^{2x-1}$ has the solution:

A. $x = \dfrac{-\log 3 - 3\log 2}{\log 2 - 2\log 3}$

B. $x = \dfrac{2}{3}$

C. $x = 1$

D. No Solution

26. The equation $\log_3 x - \log_3 2 = \log_3 7$ has the solution:

A. $x = 8$
B. $x = 9$
C. $x = 11$
D. $x = 14$

27. The equation $\log_2 x + \log_2 (x+2) = 3$ has the solution:

A. $x = 2$
B. $x = -4, 2$
C. $x = 3$
D. $x = 2, 3$

28. The equation $(\log x)^2 - 4\log x - 5 = 0$ has the solution:

A. $x = \dfrac{1}{10}$
B. $x = \dfrac{1}{10}, 100000$

C. $x = 1000$

D. No Solution

29. The expression $\log_{\frac{1}{5}}\left(\frac{1}{x}\right)$ is equivalent to:

A. $-\log_5 x$

B. $\log_5 x$

C. $\log\left(\frac{x}{5}\right)$

D. $\log(5x)$

30. The expression $\log_9(\log_2 8)$ is equivalent to:

A. $\frac{1}{8}$

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

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

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

31. The equation $\log_{\sqrt{2}} x^4 + 4 = 12$ has the solution:

A. 2

B. 4

C. 8

D. 16

32. The expression $4\log a - \frac{1}{2}\log b + \log c$ is equivalent to:

A. $\log\left(\frac{a^4\sqrt{b}}{c}\right)$

B. $\log\left(\frac{a^4 c}{\sqrt{b}}\right)$

C. $\log\left(\frac{4ac}{\sqrt{b}}\right)$

D. $\log\left(\frac{8ac}{b}\right)$

33. The graphs of $y = 3^x$ and $y = \log_3 x$ are:

A. Reflected across the line y = 0.

B. Reflected across the line x = 0.

C. Reflected across the line y = x.

D. Identical.

34. The graph of $y = 2\log_2(2x+6) - 1$ has:

A. A horizontal asymptote at y = -1

B. A horizontal asymptote at y = 1

C. A vertical asymptote at x = -6

D. A vertical asymptote at x = -3

35. The graph of $y = \log_2 \sqrt{x}$ is the same as:

A. The graph of $y = \log_2 x$ with a vertical stretch by a scale factor of $\frac{1}{2}$.

B. The graph of $y = \log_2 x$ with a vertical stretch by a scale factor of 2.

C. The graph of $y = \log_2 x$.

D. A vertical asymptote at x = -3

36. The graph of $y = \log_3(x^2 - 4) - \log_3(x - 2)$ has a domain and range of:

A. D: {x | x > 2, x ε R}; R: {y | y > $\log_3 4$, y ε R}

B. D: {x | x ≥ 2, x ε R}; R: {y | y ≥ $\log_3 4$, y ε R}

C. D: {x | x ≥ 2, x ε R}; R: {y | y ≥ 0, y ε R}

D. D: {x | x ε R}; R: {y | y > y ε R}

37. If the graph of $y = \log_b x$ passes through the point (8, 2), the value of b is:

A. 2

B. $2\sqrt{2}$

C. $2\sqrt{3}$

D. 10

38. The graph of $y = \log_3 x$ can be transformed to the graph of $y = \log_3(9x)$ by either a stretch or a translation. The two transformation equations are:

A. $y = f(9x)$ or $y = f(x) - 1$

B. $y = f(9x)$ or $y = f(x) + 1$

C. $y = f(9x)$ or $y = f(x) + 2$

D. $y = f(9x)$ or $y = f(x) + 3$

39. If the point (4, 1) exists on the graph of $y = \log_4 x$, what is the point after the transformation $y = \log_4(2x + 6)$?

A. (-4, 1)

B. (-2, -1)

C. (-1, 1)

D. (0, 2)

40. The equation of the reflection line for the graphs of $f(x) = b^x$ and $g(x) = \left(\frac{1}{b}\right)^x$ is:

A. $x = 0$

B. $y = 0$

C. $y = x$

D. $y = b$

41. The inverse of $f(x) = 3^x + 4$ is:

A. $f^{-1}(x) = \log_3(x - 4)$

B. $f^{-1}(x) = \log_4(x - 3)$

C. $f^{-1}(x) = 4^x + 3$

D. $f^{-1}(x) = -3^x - 4$

42. If the point (k, 3) exists on the inverse of $y = 2^x$, the value of k is:

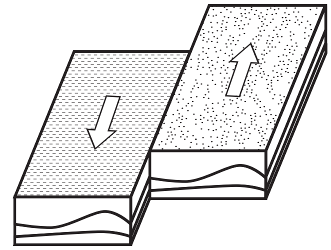
A. 2

B. 3

C. 4

D. 8

43. Earthquakes can be analyzed with the formula:



$$\boxed{M_2 - M_1 = \log \frac{A_2}{A_1}}$$

where M is the magnitude of the earthquake (unitless), and A is the seismograph amplitude of the earthquake being measured (m).

The magnitude of an earthquake with triple the seismograph amplitude of a magnitude 5.0 earthquake is?

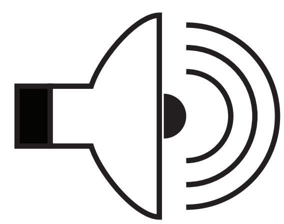
A. 5.5

B. 8.2

C. 9.0

D. 15.0

44. Sound intensity can be analyzed with the formula:



$$\boxed{\frac{I_2}{I_1} = 10^{\frac{L_2 - L_1}{10}}}$$

where I is the intensity of the sound being measured (W/m^2), and L is the perceived loudness of the sound (dB).

How many times more intense is a 40 dB sound than a 20 dB sound?

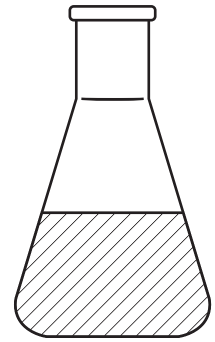
A. 2

B. 20

C. 100

D. 1000

45. The pH of a solution can be measured with the formula



$$\boxed{pH = -\log\left[H^+\right]}$$

where $[H^+]$ is the concentration of hydrogen ions in the solution (mol/L). Solutions with a pH less than 7 are acidic, and solutions with a pH greater than 7 are basic.

A formula that can be used to compare two acids is:

A. $\dfrac{\left[H^+\right]_2}{\left[H^+\right]_1} = 10^{pH_2 - pH_1}$

B. $\dfrac{\left[H^+\right]_2}{\left[H^+\right]_1} = 10^{-(pH_2 - pH_1)}$

C. $pH_2 - pH_1 = -\log\dfrac{\left[H^+\right]_1}{\left[H^+\right]_2}$

D. $pH_2 - pH_1 = \log\dfrac{\left[H^+\right]_2}{\left[H^+\right]_1}$

46. In music, a chromatic scale divides an octave into 12 equally-spaced pitches. An octave contains 1200 cents *(a unit of measure for musical intervals)*, and each pitch in the chromatic scale is 100 cents apart. The relationship between cents and note frequency is given by the formula:

$$\boxed{c_2 - c_1 = 1200\left(\log_2 \frac{f_2}{f_1}\right)}$$

How many cents separate two notes, where one note is double the frequency of the other note?

A. 2

B. 100

C. 200

D. 1200

Exponential and Logarithmic Functions Practice Exam - ANSWER KEY

Video solutions are in italics.

1. **B** *Exponential Functions, Example 1*
2. **B** *Exponential Functions, Example 2b*
3. **D** *Exponential Functions, Example 4b*
4. **D** *Exponential Functions, Example 5a*
5. **A** *Exponential Functions, Example 6c*
6. **A** *Exponential Functions, Example 6f (i)*
7. **A** *Exponential Functions, Example 7c*
8. **D** *Exponential Functions, Example 8f*
9. **B** *Exponential Functions, Example 11b*
10. **D** *Exponential Functions, Example 12b*
11. **C** *Exponential Functions, Example 13a*
12. **B** *Exponential Functions, Example 13c*
13. **C** *Exponential Functions, Example 15a*
14. **C** *Exponential Functions, Example 16 (a, b)*
15. **C** *Exponential Functions, Example 17b*
16. **C** *Exponential Functions, Example 19e*
17. **B** *Laws of Logarithms, Example 3g*
18. **A** *Laws of Logarithms, Example 5h*
19. **C** *Laws of Logarithms, Example 7h*
20. **D** *Laws of Logarithms, Example 9h*
21. **A** *Laws of Logarithms, Example 10c*
22. **C** *Laws of Logarithms, Example 10h*
23. **B** *Laws of Logarithms, Example 11a*
24. **C** *Laws of Logarithms, Example 11c*
25. **A** *Laws of Logarithms, Example 12b*
26. **D** *Laws of Logarithms, Example 13d*
27. **A** *Laws of Logarithms, Example 14a*
28. **B** *Laws of Logarithms, Example 15c*
29. **B** *Laws of Logarithms, Example 16f*
30. **C** *Laws of Logarithms, Example 18f*
31. **A** *Laws of Logarithms, Example 19c*
32. **B** *Laws of Logarithms, Example 20g*
33. **C** *Logarithmic Functions, Example 2a*
34. **D** *Logarithmic Functions, Example 5c*
35. **A** *Logarithmic Functions, Example 6a*
36. **A** *Logarithmic Functions, Example 6c*
37. **B** *Logarithmic Functions, Example 9a*
38. **C** *Logarithmic Functions, Example 10a*
39. **C** *Logarithmic Functions, Example 10b*
40. **A** *Logarithmic Functions, Example 11a*
41. **A** *Logarithmic Functions, Example 11c*
42. **D** *Logarithmic Functions, Example 11e*
43. **A** *Logarithmic Functions, Example 12g*
44. **C** *Logarithmic Functions, Example 13e*
45. **B** *Logarithmic Functions, Example 14d*
46. **D** *Logarithmic Functions, Example 15c*

Math 30-1 Practice Exam: Tips for Students

• Every question in the practice exam has already been covered in the Math 30-1 workbook. It is recommended that students refrain from looking at the practice exam until they have completed their studies for the unit.

• Do not guess on a practice exam. The practice exam is a self-diagnostic tool that can be used to identify knowledge gaps. Leave the answer blank and study the solution later.