

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. $y = 3^x$

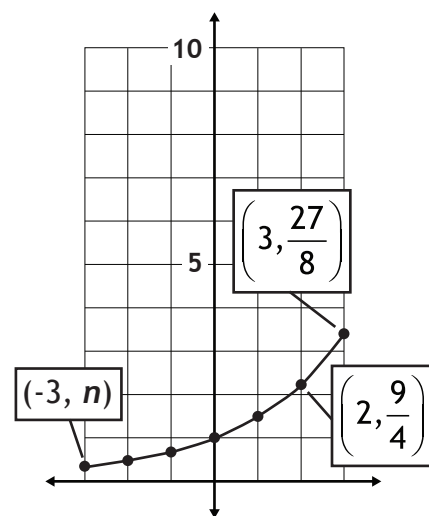
2. The point $(-3, n)$ exists on the exponential graph shown. The value of n is:

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 $y = -2$

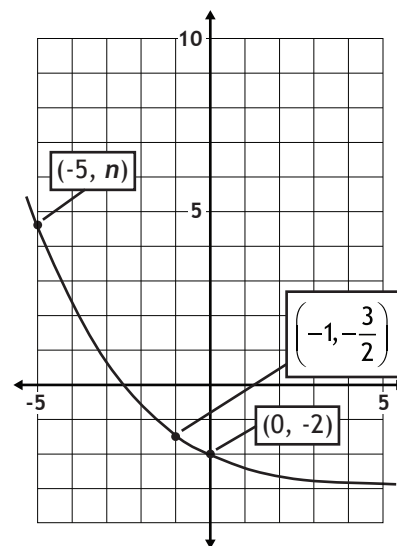
4. The point $(-5, n)$ exists on the exponential graph shown. If the function has the form $y = ab^x + k$, the value of n is:

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 $16^{3x} = (2^{5x+2})(8^{2x})$ 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 $4^{2x} - 6(4)^x + 8 = 0$ 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. $m(t) = 5(90)^{\frac{t}{5}}$

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

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

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



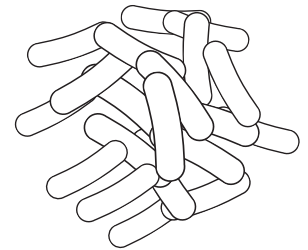
14. A bacterial culture contains 800 bacteria initially and doubles every 90 minutes. The quantity of bacteria that exists in the culture after 8 hours is:

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

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

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

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

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

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

B. $2k$

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

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

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

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

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. $x = \frac{1}{10}$

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

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

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

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

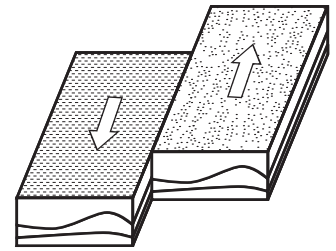
33. The graphs of $y = 3^x$ and $y = \log_3 x$ are:
- Reflected across the line $y = 0$.
 - Reflected across the line $x = 0$.
 - Reflected across the line $y = x$.
 - Identical.
34. The graph of $y = 2\log_2(2x + 6) - 1$ has:
- A horizontal asymptote at $y = -1$
 - A horizontal asymptote at $y = 1$
 - A vertical asymptote at $x = -6$
 - A vertical asymptote at $x = -3$
35. The graph of $y = \log_2 \sqrt{x}$ is the same as:
- The graph of $y = \log_2 x$ with a vertical stretch by a scale factor of $\frac{1}{2}$.
 - The graph of $y = \log_2 x$ with a vertical stretch by a scale factor of 2.
 - The graph of $y = \log_2 x$.
 - 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:
- D: $\{x \mid x > 2, x \in \mathbb{R}\}$; R: $\{y \mid y > \log_3 4, y \in \mathbb{R}\}$
 - D: $\{x \mid x \geq 2, x \in \mathbb{R}\}$; R: $\{y \mid y \geq \log_3 4, y \in \mathbb{R}\}$
 - D: $\{x \mid x \geq 2, x \in \mathbb{R}\}$; R: $\{y \mid y \geq 0, y \in \mathbb{R}\}$
 - D: $\{x \mid x \in \mathbb{R}\}$; R: $\{y \mid y > y \in \mathbb{R}\}$
37. If the graph of $y = \log_b x$ passes through the point $(8, 2)$, the value of b is:
- 2
 - $2\sqrt{2}$
 - $2\sqrt{3}$
 - 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:

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

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



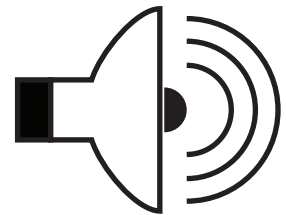
The magnitude of an earthquake with triple the seismograph amplitude of a magnitude 5.0 earthquake is?

- A. 5.5
- B. 8.2
- C. 9.0
- D. 15.0

44. Sound intensity can be analyzed with the formula:

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

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



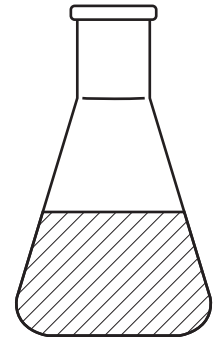
How many times more intense is a 40 dB sound than a 20 dB sound?

- A. 2
- B. 20
- C. 100
- D. 1000

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

$$\text{pH} = -\log [\text{H}^+]$$

where $[\text{H}^+]$ 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. $\frac{[\text{H}^+]_2}{[\text{H}^+]_1} = 10^{\text{pH}_2 - \text{pH}_1}$

B. $\frac{[\text{H}^+]_2}{[\text{H}^+]_1} = 10^{-(\text{pH}_2 - \text{pH}_1)}$

C. $\text{pH}_2 - \text{pH}_1 = -\log \frac{[\text{H}^+]_1}{[\text{H}^+]_2}$

D. $\text{pH}_2 - \text{pH}_1 = \log \frac{[\text{H}^+]_2}{[\text{H}^+]_1}$

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:



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

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.
- It is recommended that students use Udemy to access the video solutions for three reasons:
 - 1) The videos can be downloaded faster on Udemy than the math30.ca website.
 - 2) It is quicker to scan through each video on Udemy.
 - 3) The Udemy app is mobile-friendly, but the math30.ca website requires Adobe Flash Player.