1. Solve the equation using only pencil and paper.

$$\left(\frac{1}{3}\right)^{\mu} = \frac{1}{3}$$

A. $\mu = -3$

B. $\mu = 1$

C. $\mu = 4$

D. $\mu = -1$

E. $\mu = -2$

F. $\mu = 3$

G. $\mu = 0$

H. $\mu = 5$

2. Solve the equation using only pencil and paper.

$$3^{8\beta+4} = \sqrt{27}$$

A. $\beta = -\frac{5}{16}$

B. $\beta = -\frac{23}{80}$

C. $\beta = -\frac{11}{48}$

D. $\beta = -\frac{13}{48}$

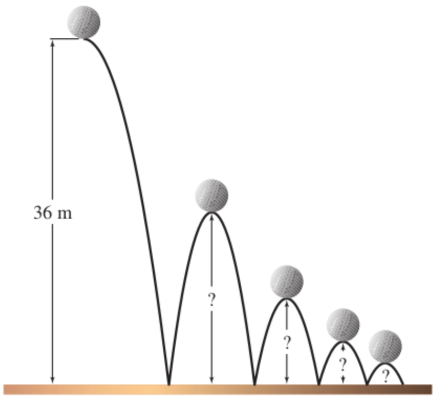
E. $\beta = -\frac{3}{16}$

F. $\beta = -\frac{7}{32}$

G. $\beta = -\frac{9}{32}$

H. $\beta = -\frac{1}{4}$

3. A golf ball is dropped from 36 m onto a surface which causes it to rebound to $\frac{1}{3}$ of its previous height on each bounce. Determine the heights of the first four bounces: h_1, h_2, h_3, and h_4. Round each height to the nearest hundredth.



A. $h_1 = 28.8$, $h_2 = 7.2$, $h_3 = 1.8$, $h_4 = 0.45$.

B. $h_1 = 12$, $h_2 = 7.2$, $h_3 = 4.32$, $h_4 = 2.59$.

C. $h_1 = 12$, $h_2 = 4$, $h_3 = 1.33$, $h_4 = 0.44$.

D. $h_1 = 24$, $h_2 = 12$, $h_3 = 6$, $h_4 = 3$.

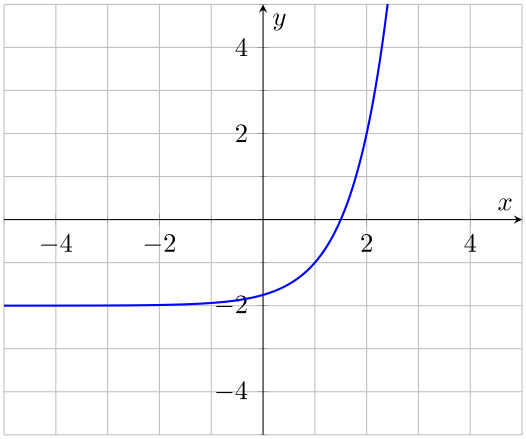
E. $h_1 = 24$, $h_2 = 16$, $h_3 = 10.67$, $h_4 = 7.11$.

F. $h_1 = 7.2$, $h_2 = 5.4$, $h_3 = 4.05$, $h_4 = 3.04$.

G. $h_1 = 28.8$, $h_2 = 23.04$, $h_3 = 18.43$, $h_4 = 14.75$.

H. $h_1 = 7.2$, $h_2 = 1.44$, $h_3 = 0.29$, $h_4 = 0.06$.

4. TRUE or FALSE: The graph below represents a one-to-one function. (Hint: use the horizontal line test.)



A. True

B. False

5. Find the inverse f^{-1} of the function f.

$$f(x) = \sqrt[3]{x} - 5$$

A. $f^{-1}(x) = x^3 + 125$

B. $f^{-1}(x) = x^3 - 5$

C. $f^{-1}(x) = x^3 + 5$

D. $f^{-1}(x) = \sqrt[3]{x + 5}$

E. $f^{-1}(x) = (x - 5)^3$

F. $f^{-1}(x) = (x + 5)^3$

G. $f^{-1}(x) = x^3 - 125$

H. $f^{-1}(x) = \sqrt[3]{x - 5}$

6. Consider the function f below. TRUE or FALSE: The function f is one-to-one.

$$f = \{(\pi, c), (\bigstar, -1), (c, -\pi), (-1, 8)\}$$

A. False

B. True

7. Evaluate the logarithmic expression.

$$\log_3 27$$

A. -3

B. 3

C. 1

D. 2

E. 0

F. -2

G. 4

H. -1

8. Solve the logarithmic equation.

$$\log_2 x = -1$$

A. $x = 2$

B. $x = 7$

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

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

E. $x = 9$

F. $x = \frac{1}{7}$

G. $x = 4$

H. $x = \frac{1}{9}$

9. Evaluate the logarithmic expression.

$$\log_{\frac{3}{4}} \frac{9}{16}$$

A. 4

B. -1

C. 2

D. -2

E. 1

F. -3

G. 0

H. 3

10. Evaluate the logarithmic expression.

$$\log \sqrt[4]{0.01}$$

A. 1

B. -1

C. $-\frac{3}{4}$

D. $-\frac{1}{4}$

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

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

G. 0

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

11. Use the change of base formula to evaluate the following logarithm. Round your answer to the nearest hundredth.

$$\log_{12} 14$$

A. 1.35

B. 0.83

C. 0.21

D. 1.06

E. 0.41

F. 1.77

G. 0.63

H. 1.92

12. Match the expression with an equal expression from choices A through F.

$$\log \frac{x}{y}$$

A. $\log x + \log y$

B. $x \log y$

C. $y \log x$

D. This expression cannot be simplified.

E. $\log x - \log y$

F. x

13. Use the properties of logarithms to express the logarithm in terms of logarithms of simpler expressions. Each logarithmic term should have only one variable, and no exponents or radicals. Assume that the argument of each logarithm is a positive real number.

$$\ln\left(\frac{(3\zeta+7)^4}{\sqrt[7]{13\zeta-11}}\right)$$

A. $4\ln(3\zeta+7)-\frac{1}{7}\ln(13\zeta-11)$

B. $\ln(3\zeta+7)^4-\ln(13\zeta-11)^{\frac{1}{7}}$

C. $\frac{4(\ln(3\zeta)+\ln(7))}{\frac{1}{7}(\ln(13\zeta)-\ln(11))}$

D. $\ln(3\zeta+7)^4+\ln(13\zeta-11)^{\frac{1}{7}}$

E. $4\ln(3\zeta+7)+\frac{1}{7}\ln(13\zeta-11)$

F. $\frac{\ln(3\zeta+7)^4}{\ln(13\zeta-11)^{\frac{1}{7}}}$

G. $\frac{4(\ln(3\zeta)+\ln(7))}{(\ln(\sqrt[7]{13\zeta})-\ln(\sqrt[7]{11}))}$

H. $\frac{4\ln(3\zeta+7)}{\frac{1}{7}\ln(13\zeta-11)}$

14. Combine the logarithmic terms into a single logarithmic expression with a coefficient of 1. Assume that the argument of each logarithm is a positive real number.

$$\frac{1}{5}\ln(\sigma)+\frac{1}{2}\ln(\xi)$$

A. $\ln(\frac{1}{5}\sigma+\frac{1}{2}\xi)$

B. $\ln(\sqrt[5]{\sigma}-\sqrt{\xi})$

C. $\ln(\frac{1}{5}\sigma-\frac{1}{2}\xi)$

D. $\ln\left(\frac{\frac{1}{5}\sigma}{\frac{1}{2}\xi}\right)$

E. $\ln(\sqrt[5]{\sigma}+\sqrt{\xi})$

F. $\ln\left(\frac{\sqrt[5]{\sigma}}{\sqrt{\xi}}\right)$

G. $\ln(\frac{1}{5}\sigma\cdot\frac{1}{2}\xi)$

H. $\ln(\sqrt[5]{\sigma}\sqrt{\xi})$

15. Solve the exponential equation and round your answer to the nearest hundredth.

$$9e^{6\tau} = 5$$

A. $\tau \approx -0.94$

B. $\tau \approx 0.78$

C. $\tau \approx -0.59$

D. $\tau \approx -0.1$

E. $\tau \approx 0.49$

F. $\tau \approx -0.78$

G. $\tau \approx 0.28$

H. $\tau \approx 0.51$

16. The value V of a particular model of automobile after t years of depreciation is given by the formula

$$V = 37000e^{-0.2t} + 1000.$$

Approximately how many years will it take for the value to depreciate to \$6000? Round your answer to the nearest hundredth.

A. It will take approximately $t = 10.56$ years.

B. It will take approximately $t = 10.69$ years.

C. It will take approximately $t = 9.45$ years.

D. It will take approximately $t = 10.89$ years.

E. It will take approximately $t = 10.01$ years.

F. It will take approximately $t = 10.37$ years.

G. It will take approximately $t = 9.02$ years.

H. It will take approximately $t = 9.24$ years.

17. Solve the exponential equation and round your answer to the nearest hundredth.

$$5^{3\sigma-6} = 4$$

A. $\sigma \approx 2.4$

B. $\sigma \approx 2.88$

C. $\sigma \approx 2.13$

D. $\sigma \approx 2.29$

E. $\sigma \approx 1.61$

F. $\sigma \approx 2.74$

G. $\sigma \approx 1.35$

H. $\sigma \approx 2.48$

18. Suppose $11000 is invested at 5% with interest compounded semiannually. How long will it take for this investment to double its value? Round your answer to the nearest tenth.

A. The investment will double in approximately $t = 13.93$ years.

B. The investment will double in approximately $t = 14.36$ years.

C. The investment will double in approximately $t = 13.6$ years.

D. The investment will double in approximately $t = 13.28$ years.

E. The investment will double in approximately $t = 14.04$ years.

F. The investment will double in approximately $t = 13.82$ years.

G. The investment will double in approximately $t = 14.68$ years.

H. The investment will double in approximately $t = 13.21$ years.

19. Carbon-14 decays continuously at the rate of 0.01245% per year. An archaeologist has determined that only 5% of the original carbon-14 from a plant specimen remains. Estimate the age of this specimen.

A. The specimen is approximately 23991.11 years old.

B. The specimen is approximately 24062.11 years old.

C. The specimen is approximately 23997.11 years old.

D. The specimen is approximately 24136.11 years old.

E. The specimen is approximately 24083.11 years old.

F. The specimen is approximately 24157.11 years old.

G. The specimen is approximately 24056.11 years old.

H. The specimen is approximately 23978.11 years old.

20. Seismologists use the Richter scale to measure the magnitude of earthquakes. The equation

$$R = \log \frac{A}{a}$$

compares the amplitude A of the shock wave of an earthquake to the amplitude a of a reference shock wave of minimal intensity. The amplitude of the September 19th, 1985, earthquake in Mexico City was 63100000 times the reference amplitude. Calculate the magnitude of this earthquake on the Richter scale. Round your answer to the nearest hundredth.

A. The magnitude of the earthquake was 7.26 on the Richter scale.

B. The magnitude of the earthquake was 8.02 on the Richter scale.

C. The magnitude of the earthquake was 8.19 on the Richter scale.

D. The magnitude of the earthquake was 7.04 on the Richter scale.

E. The magnitude of the earthquake was 8.34 on the Richter scale.

F. The magnitude of the earthquake was 8.76 on the Richter scale.

G. The magnitude of the earthquake was 6.92 on the Richter scale.

H. The magnitude of the earthquake was 7.8 on the Richter scale.

Answers

1. B.
2. A.
3. C.
4. A.
5. F.
6. B.
7. B.
8. D.
9. C.
10. H.
11. D.
12. E.
13. A.
14. H.
15. D.
16. E.
17. D.
18. E.
19. B.
20. H.