1. The strontium-90 in a nuclear reactor decays continuously. If 30 mg is present initially, the amount present after t years is given by $A(t) = 30e^{-0.0248t}$. Approximate to the nearest hundredth of a milligram the amount left after 10 years.

A. There will be approximately 23.52 mg left after 10 years.

B. There will be approximately 23.77 mg left after 10 years.

C. There will be approximately 22.79 mg left after 10 years.

D. There will be approximately 23.95 mg left after 10 years.

E. There will be approximately 22.84 mg left after 10 years.

F. There will be approximately 23.41 mg left after 10 years.

G. There will be approximately 23.93 mg left after 10 years.

H. There will be approximately 22.86 mg left after 10 years.

2. Solve the equation using only pencil and paper.

$$\left(\frac{1}{2}\right)^{4\rho-9} = \frac{1}{2}$$

A. $\rho = \frac{43}{16}$

B. $\rho = \frac{41}{16}$

C. $\rho = \frac{31}{12}$

D. $\rho = \frac{11}{4}$

E. $\rho = \frac{8}{3}$

F. $\rho = \frac{5}{2}$

G. $\rho = \frac{21}{8}$

H. $\rho = \frac{51}{20}$

3. Solve the equation using only pencil and paper.

$$\left(\frac{1}{2}\right)^{6n+9} = \sqrt[4]{\frac{1}{8}}$$

A. $n = -\frac{95}{72}$

B. $n = -\frac{5}{4}$

C. $n = -\frac{11}{8}$

D. $n = -\frac{29}{24}$

E. $n = -\frac{31}{24}$

F. $n = -\frac{91}{72}$

G. $n = -\frac{161}{120}$

H. $n = -\frac{4}{3}$

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

$$f = \{(1,1), (-2,1), (-1,1), (c,1)\}$$

A. False

B. True

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

$$f(x) = \frac{1}{7}x + 4$$

A. $f^{-1}(x) = 4x + 28$

B. $f^{-1}(x) = 7x - 4$

C. $f^{-1}(x) = 7x - 28$

D. $f^{-1}(x) = \frac{1}{4}x + 7$

E. $f^{-1}(x) = \frac{1}{7}x + 4$

F. $f^{-1}(x) = 4x + 7$

G. $f^{-1}(x) = \frac{x+7}{4}$

H. $f^{-1}(x) = \frac{x+4}{7}$

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

$$f(x) = \sqrt[3]{x} - 2$$

A. $f^{-1}(x) = x^3 - 8$

B. $f^{-1}(x) = x^3 + 8$

C. $f^{-1}(x) = x^3 - 2$

D. $f^{-1}(x) = \sqrt[3]{x - 2}$

E. $f^{-1}(x) = (x + 2)^3$

F. $f^{-1}(x) = x^3 + 2$

G. $f^{-1}(x) = \sqrt[3]{x + 2}$

H. $f^{-1}(x) = (x - 2)^3$

7. Solve the logarithmic equation.

$$\log_8 x = 2$$

A. $x = 16$

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

C. $x = 64$

D. $x = \frac{1}{64}$

E. $x = \frac{1}{16}$

F. $x = 36$

G. $x = 9$

H. $x = \frac{1}{36}$

8. Evaluate the logarithmic expression.

$$\log_4 \sqrt{\frac{1}{4}}$$

A. $-\frac{3}{2}$

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

C. -2

D. 2

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

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

G. 0

H. 1

9. Solve the logarithmic equation.

$$\log_x 4 = 2$$

A. $x = 3$

B. $x = \frac{\sqrt{4}}{4}$

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

D. $x = 5$

E. $x = \frac{\sqrt{5}}{5}$

F. $x = 4$

G. $x = 2$

H. $x = \frac{\sqrt{3}}{3}$

10. Approximate the value of the expression to the nearest hundredth.

$$\ln 0.7$$

A. -0.52

B. -0.29

C. -0.36

D. -0.75

E. -0.81

F. 0.46

G. -0.04

H. 0.43

11. Evaluate the logarithmic expression.

$$\log \sqrt[7]{0.01}$$

A. $-\frac{4}{7}$

B. $-\frac{2}{7}$

C. $-\frac{3}{7}$

D. $-\frac{1}{7}$

E. 0

F. $\frac{2}{7}$

G. $\frac{3}{7}$

H. $\frac{4}{7}$

12. 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.

$$\log \sqrt[5]{\frac{p^{-3}x^2}{\lambda^3}}$$

A. $-\frac{3}{5}\log(p) - \frac{2}{5}\log(x) + \frac{3}{5}\log(\lambda)$

B. $\frac{\log \sqrt[5]{p^{-3}} \log \sqrt[5]{x^2}}{\log \sqrt[5]{\lambda^3}}$

C. $-\frac{3}{5}\log(p) + \frac{2}{5}\log(x) - \frac{3}{5}\log(\lambda)$

D. $\frac{\frac{3}{5}\log p^{-3} + \log \frac{2}{5}x^2}{\frac{3}{5}\log \lambda^3}$

E. $\frac{\log \sqrt[5]{p^{-3}x^2}}{\log \sqrt[5]{\lambda^3}}$

F. $-\frac{3}{5}\log(p) + \frac{2}{5}\log(x) + \frac{3}{5}\log(\lambda)$

G. $\frac{\log \sqrt[5]{p^{-3}} + \log \sqrt[5]{x^2}}{\log \sqrt[5]{\lambda^3}}$

H. $-\frac{3}{5}\log(p) - \frac{2}{5}\log(x) - \frac{3}{5}\log(\lambda)$

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

$$\log_{19} 11$$

A. -0.08

B. -0.13

C. 0.29

D. 1.68

E. 0.65

F. 0.56

G. 0.81

H. 1.34

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

$$\log_{\frac{2}{3}} \frac{1}{4}$$

A. 2.58

B. 3.42

C. 3.77

D. 3.58

E. 4.33

F. 3.2

G. 4.14

H. 2.73

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

$$2e^{6\sigma} = 4$$

A. $\sigma \approx -0.72$

B. $\sigma \approx 0.76$

C. $\sigma \approx 0.63$

D. $\sigma \approx 1.01$

E. $\sigma \approx 0.12$

F. $\sigma \approx -0.8$

G. $\sigma \approx 0.98$

H. $\sigma \approx 0.15$

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

$$V = 31000e^{-0.2t} + 1000.$$

Approximately how many years will it take for the value to depreciate to \$5000? Round your answer to the nearest hundredth.

A. It will take approximately $t = 11.03$ years.

B. It will take approximately $t = 9.66$ years.

C. It will take approximately $t = 11.11$ years.

D. It will take approximately $t = 11.12$ years.

E. It will take approximately $t = 9.95$ years.

F. It will take approximately $t = 10.1$ years.

G. It will take approximately $t = 9.71$ years.

H. It will take approximately $t = 10.24$ years.

17. Find the exact solution to the equation.

$$0.33e^{-0.25\alpha} = 2.55$$

A. $\alpha = \frac{1}{0.25}\frac{\ln(2.55)}{\ln(0.33)}$

B. $\alpha = -\frac{1}{0.25}\frac{\ln(0.33)}{\ln(2.55)}$

C. $\alpha = \frac{1}{0.25}\ln(\frac{0.33}{2.55})$

D. $\alpha = -\frac{1}{0.25}\ln(\frac{0.33}{2.55})$

E. $\alpha = \frac{1}{0.25}\frac{\ln(0.33)}{\ln(2.55)}$

F. $\alpha = -\frac{1}{0.25}\ln(\frac{2.55}{0.33})$

G. $\alpha = -\frac{1}{0.25}\frac{\ln(2.55)}{\ln(0.33)}$

H. $\alpha = \frac{1}{0.25}\ln(\frac{2.55}{0.33})$

18. The number n of monthly payments of amount P required to completely pay off a loan of amount A borrowed at interest rate R is given by the formula

$$n = -\frac{\log\left(1 - \frac{AR}{12P}\right)}{\log\left(1 + \frac{R}{12}\right)}.$$

Determine the number of monthly car payments of \$200 required to pay off a \$8000 car loan when the interest rate is 9%. Round your answer to the nearest number of payments.

A. The loan will require 48 payments

B. The loan will require 47 payments

C. The loan will require 44 payments

D. The loan will require 53 payments

E. The loan will require 42 payments

F. The loan will require 38 payments

G. The loan will require 52 payments

H. The loan will require 49 payments

19. Find the value of $19000 invested at 4% with interest compounded annually for 3 years. Round your answer to the nearest penny.

A. The value of the investment will be $21372.42.

B. The value of the investment will be $21403.12.

C. The value of the investment will be $21452.12.

D. The value of the investment will be $21382.92.

E. The value of the investment will be $21392.62.

F. The value of the investment will be $21303.32.

G. The value of the investment will be $21292.52.

H. The value of the investment will be $21463.02.

20. Suppose \$17000 is invested at 2% with interest compounded continuously. 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 $t = 35.3$ years.

B. The investment will double in approximately $t = 34.18$ years.

C. The investment will double in approximately $t = 35.38$ years.

D. The investment will double in approximately $t = 34.22$ years.

E. The investment will double in approximately $t = 34.66$ years.

F. The investment will double in approximately $t = 34.15$ years.

G. The investment will double in approximately $t = 35$ years.

H. The investment will double in approximately $t = 34.57$ years.

Answers

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