

Multiple Choice

Identify the choice that best completes the statement or answers the question.

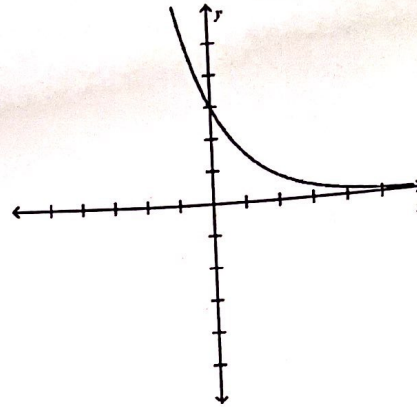
1. Match the following graph with its function.

A. $y = 3(0.5)^x$

B. $y = -\frac{5}{6} \log x$

C. $y = 0.5(3)^x$

D. $y = -3 \log x$



2. Determine the y-intercept of the exponential function $f(x) = 4\left(\frac{1}{2}\right)^x$

A. 0

B. 1

C. 2

D. 4

3. Express $\left(\frac{1}{27}\right)^{x+1}$ as a power with a base of 3.

A. $3^{(3x-3)}$

B. $3^{(-3x-3)}$

C. $3^{(-3x+3)}$

D. $3^{(3x+3)}$

4. Solve the following exponential equation by writing both sides with the same base.

$$2^{3-x} = \frac{1}{32}$$

- A. $x = 7$
- B. $x = 8$
- C. $x = 9$
- D. $x = 10$

5. The following data set involves exponential decay. Determine the missing value from the table.

x	1	2	3	4	5	6	7
y	6144	1536	384	96		6	1.5

- A. 36
- B. 18
- C. 48
- D. 24

6. Denis recently spent \$1280 on a new laptop for his home business. He reads that the depreciation rate for this model laptop is 25%. How much money should Denis expect to sell his laptop for in three years?

- A. \$540
- B. \$960
- C. \$320
- D. \$740

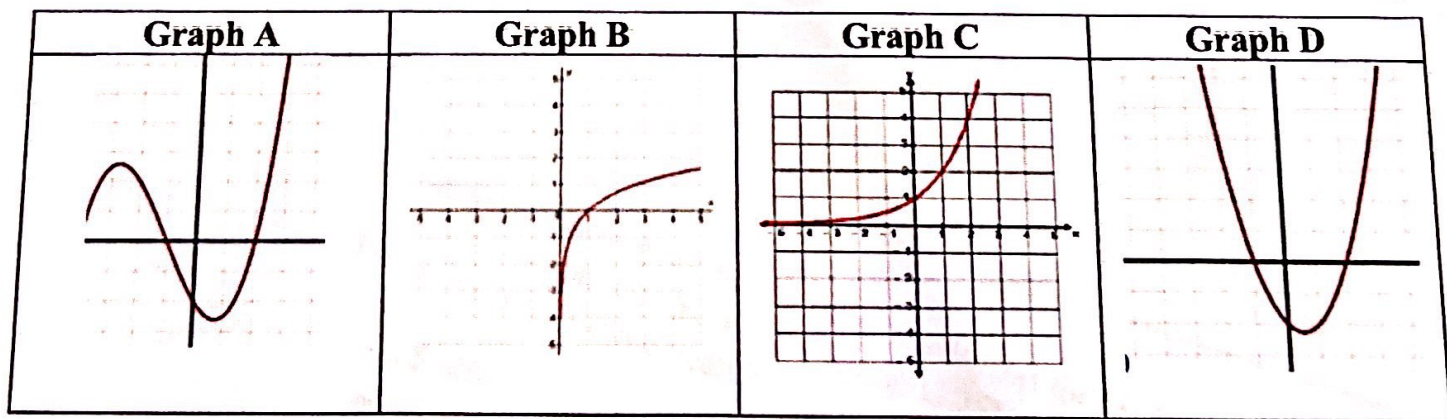
7. Estimate the following value for “x” given $2^x = 12$.

- A. 3.46
 - B. 6
 - C. -3.58
 - D. 3.58
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8. Which exponential equation correctly represents the logarithmic equation $y = \ln 20$?

- A. $20^y = e$
 - B. $e^y = 20$
 - C. $y^{20} = e$
 - D. $y^e = 20$
-

9. Which graph best represents a logarithmic function?



- A. Graph A
- B. Graph B
- C. Graph C
- D. Graph D

10. Which logarithmic equation correctly represents the exponential equation $10^7 = x$?

- A. $x = \log 7$
 - B. $x = \log 10$
 - C. $7 = \log x$
 - D. $10 = \log x$
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11. Evaluate the logarithmic expression $\log_2 \frac{1}{8}$.

- A. 3
 - B. 0.25
 - C. -0.25
 - D. -3
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12. Determine the concentration of hydrogen ions in bleach, with a pH of 12.8. Recall that $p(x)$, is defined by the equation

$$p(x) = -\log x$$

where the concentration of hydrogen ions, x , in a solution is measured in moles per liter

- A. $1.3 \times 10^{-13} \text{ mol/L}$
- B. $1.6 \times 10^{-13} \text{ mol/L}$
- C. $1.3 \times 10^{-12} \text{ mol/L}$
- D. $1.6 \times 10^{-12} \text{ mol/L}$

13. Evaluate:

$$\log_5\left(\frac{100}{4}\right) + \log_5\left(\frac{4}{100}\right)$$

A. -4

B. 4

C. 2

D. 0

Numeric Response (1 mark each)

1. An investment can be modelled by the following growth function, where x represents the time in years:

$$y = 1200(1.115)^x$$

How long, in years, to the nearest hundredth, did it take for the account to reach \$2000?

Record your answer in the numerical response box below

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2. A research lab has a 12 mg sample of a radioactive substance. The amount of the substance, $A(t)$, left in the sample can be modelled by the half-life function

$$A(t) = 12\left(\frac{1}{2}\right)^{\frac{t}{8.5}}$$

where t represents the time, in days, after the initial time. How long does it take for the sample to reduce to 3 milligrams?

Record your answer in the numerical response box below

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3. Solve for x to the nearest hundredth $5^x = 72$.

Record your answer in the numerical response box below

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4. Solve $24 = 3^{(2x-1)}$ to the nearest hundredth.

Record your answer in the numerical response box below

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5. Solve $2^{x-1} = \left(\frac{1}{3}\right)^x$ to the nearest hundredth.

Record your answer in the numerical response box below

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Short Answer

1. Use the laws of logs to write the following as single log expressions and then determine the value of the expression. (4 marks)

a) $0.5 \log_4 4 + \log_4 32$

b) $\log_6 216 - \log_6 \left(\frac{1}{6} \right)$

Problem Show all appropriate supporting work.

1. The use of wind turbines to generate electrical energy in Europe has increased exponentially. The energy produced by wind turbines between 1980 and 1995 can be modelled by the equation

$$y = 6.489(1.580)^x$$

where y is the amount of energy produced in gigawatt-hours (GWh) and x is the years since 1980. James wanted to determine the amount of energy produced in 1994. His calculations are below:

Step A: $y = 6.489(1.580)^x$

Step B: $y = 10.25262^x$

Step C: $y = 10.25262^{14}$

Step D: $y = 1.42 \times 10^{14}$ GWh

Determine where James made his first error. Correct his error and determine the correct solution. (3 marks)

2. A social-networking site tracked the growth of its membership during its first two years.

Number of Months	1	4	6	9	12	18	24
Number of Users (thousands)	3.8	11.1	13.3	15.6	17.1	19.4	21.0

- a) Use logarithmic regression to model the data, where $y = a + b \ln x$. State the values for a and b . Round all values to the nearest hundredth. (1 mark)

$a =$ _____ $b =$ _____

- b) Estimate the number of users after 15 months, to the nearest hundred. Show your work. (2 marks)

- c) Estimate the number of users after 3 years, to the nearest hundred. Show your work. (2 marks)

3. Sarah inherits \$5000 and invests in a guaranteed investment certificate (GIC) that earns, 4.5%, compounded monthly. A function that models the growth of the investment is

$$y = 5000 \left(1 + \frac{0.045}{12} \right)^x$$

where x = number of months and y = value of investment, in dollars.

a. Determine how long it will take for the investment to be worth \$6000 at 4.5%, compounded monthly. **(3 marks)**

b. Modify the exponential function to reflect an interest rate of 4.5% compounded semi-annually, where x = number of semi-annual compounding periods and y = value of investment in dollars. **(1 mark)**