

Unit 2: Logarithms (17%) and Sequences (8%)

1. What is one-half of 2^{20} ?

- A. 2^{10} B. 1^{20} C. 2^{19} D. 1^{10}

2.

If $\log_3 y = c - \log_3 x$, where $y > 0$ and $x > 0$, then y is equal to

A. $c - x$

B. $\frac{c}{x}$

C. $\frac{c^3}{x}$

D. $\frac{3^c}{x}$

3. The sum of the infinite geometric series $\frac{1}{4} + \frac{1}{16} + \frac{1}{64} \dots$ is

- A. $21/64$ B. $1/3$
C. $1/2$ D. 1

4.

An investment of \$1 000 is earning 4% interest per annum compounded annually. If the value, V , of the investment after t years is given by $V = 1\,000(1.04)^t$, then t , written as a function of V , is

A. $t = \frac{\log(V)}{3} - \log(1.04)$

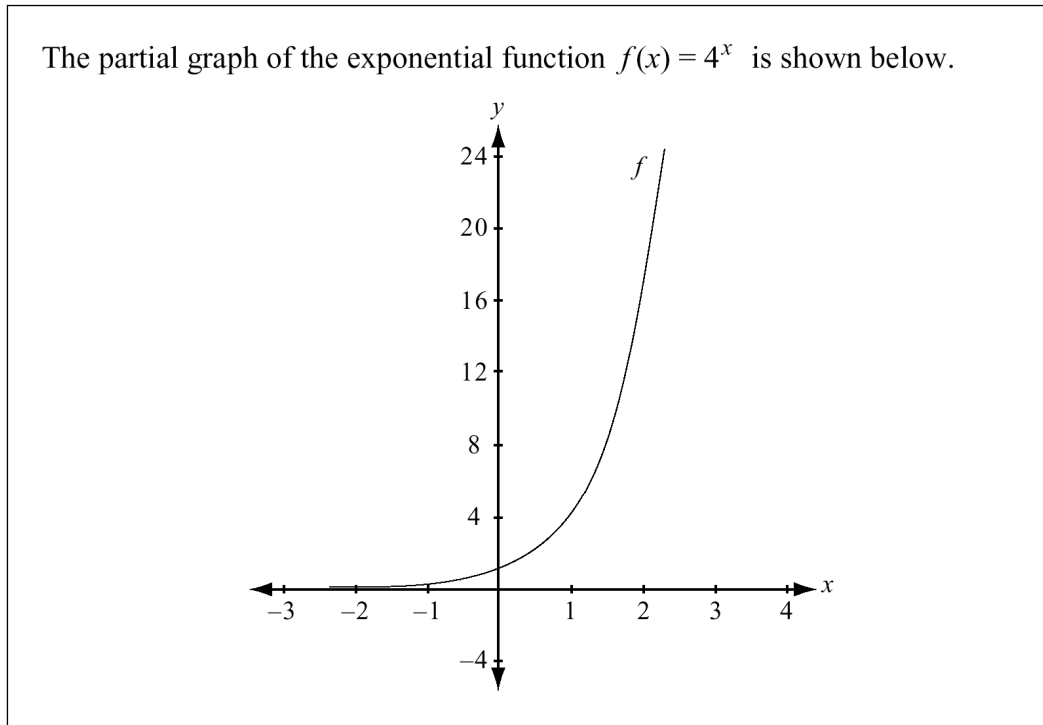
B. $t = \frac{\log(V)}{3 \log(1.04)}$

C. $t = \log(V) - 3 - \log(1.04)$

D. $t = \frac{\log(V) - 3}{\log(1.04)}$

5.

Use the following information to answer the next question.



The domain of the inverse function f^{-1} is

- A. $x > 0, x \in R$
- B. $x < 0, x \in R$
- C. $x \geq 0, x \in R$
- D. $x \in R$

6. The population of a city was 173 500 on January 1, 1978, and it was 294 000 on January 1, 1992. If the growth rate of the city can be modelled as an exponential function, then the average annual growth rate of the city, expressed to the nearest tenth of a percentage, was

- | | |
|---------|----------|
| A. 1.0% | B. 3.8% |
| C. 6.9% | D. 12.1% |

7. The price of a particular product doubles every 35 years. If the price of the product was \$16.40 on January 1, 1996, then the price of the product will be \$36.50 in the year

- | | |
|---------|---------|
| A. 2028 | B. 2031 |
| C. 2036 | D. 2040 |

8. Find the intersection point(s) of $y_1 = \left(\frac{1}{2}\right)^{x-1}$ and $y_2 = 3^x$. Solve algebraically, and then check your answer using your graphing calculator.

9. A new coal mine produced 8 Mt (megatonnes) of coal in 1997, 7 Mt in 1998, and 6.125 Mt in 1999. If this geometric pattern were to continue indefinitely, then the total mass of coal produced by this mine would approach

- A. 21.125 Mt
B. 64 Mt
C. 156.9 Mt
D. an infinite mass

10. If $\log_7 m = -\frac{2}{3}$, then the value of m , correct to the nearest hundredth, is _____.

11.

In 1996, a particular car was valued at \$27 500 and its value decreased exponentially each year afterward. For each of the first 7 years, the value of the car decreased by 24% of the previous year's value. If t is the number of years and v is the value of the car, then the equation for the car's value when $t \leq 7$ is

- A. $v = 27\,500(1.76)^t$
B. $v = 27\,500(1.24)^t$
C. $v = 27\,500(0.76)^t$
D. $v = 27\,500(0.24)^t$

12. The x-intercept of the graph of $y = \log_b x$, where $b > 0$ and $b \neq 1$, is

- A. 0
B. 1
C. undefined
D. dependent on the value of b

13. A clothing store is going out of business. The owner reduces the cost of each item by 10% of the current price at the start of each week. A jacket costs \$120.00 during the 1st week of the sale. If this jacket is still in the store during the 5th week of the sale, then the price of the jacket, to the nearest cent, will be

- A. \$70.00
B. \$70.86
C. \$78.73
D. \$80.00

14.

Use the following information to answer the next question.

The relationship between the length and mass of a particular species of snakes is

$$\log m = \log a + 3 \log l$$

where a is a given constant
 m is the mass of the snake in grams
 l is the length of the snake in metres

This relationship can also be written as

A. $\log\left(\frac{m}{al^3}\right) = 0$

B. $\log\left(\frac{m}{3al}\right) = 0$

C. $\log\left(\frac{am}{l^3}\right) = 0$

D. $\log\left(\frac{am}{3l}\right) = 0$

15. The sum of the first 10 terms of the geometric sequence $-4, 6, -9 \dots$, to the nearest tenth, is

A. 153.8

B. 90.7

C. -61.5

D. -453.3

16. If $\log_x\left(\frac{1}{64}\right) = -\frac{3}{2}$, then x is equal to

A. 16

B. 8

C. $1/8$

D. $1/16$

17. If $\log_3 x = 15$, then $\log_3\left(\frac{1}{3}x\right)$ is equal to

- A. 14
C. 5

- B. 12
D. -15

18.

The equation $y = 4^{3x}$ can also be written as

A. $y = \frac{\log_3 x}{4}$

B. $y = \frac{\log_4 x}{3}$

C. $x = \frac{\log_3 y}{4}$

D. $x = \frac{\log_4 y}{3}$

19. Three sums obtained from a particular infinite geometric sequence are $S_1=10$, $S_2=15$, and $S_3=17.5$. The sum of this entire infinite sequence is _____.

20. The value of $\sum_{n=1}^{10} (\log_2 8)^n$ is

- A. 165
C. 88 572

- B. 59 049
D. 1 398 100

21. If $\log_3(2x - y) = 2$ and $\log_2(x + 2y) = 5$, then the value of y , correct to the nearest tenth, is

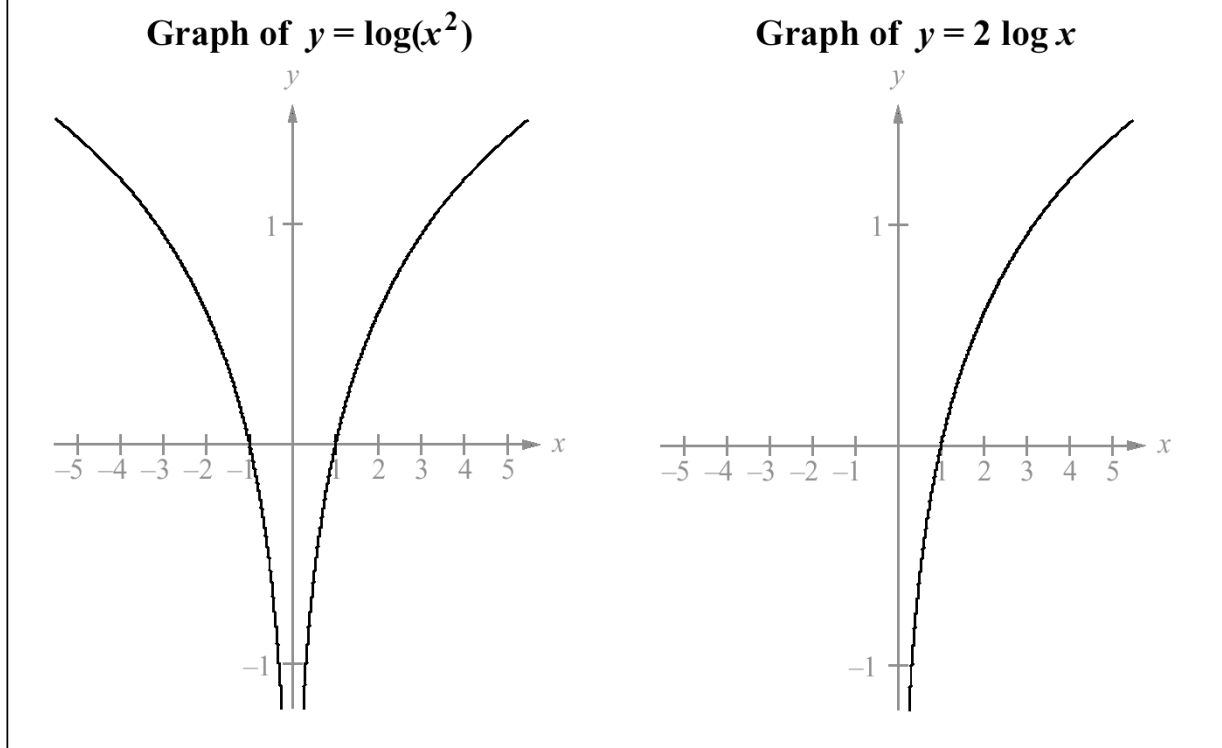
- A. -14.6
C. 11.0

- B. -8.2
D. 18.3

22.

Use the following information to answer the next question.

A student used a graphing calculator to illustrate identities. The student assumed that $\log(x^2) = 2 \log x$ because $\log_a(M^n) = n \log_a M$. The student graphed $y = \log(x^2)$ and obtained the graph shown below on the left. The student then graphed $y = 2 \log x$ and obtained the graph shown below on the right.



The student realized that the reason why the graphs are not identical is that

- A. $\log 0$ is not defined
- B. where $x < 0$, $\log(x^2)$ is defined and $\log x$ is not defined
- C. where $x < 0$, $\log x$ is defined and $\log(x^2)$ is not defined
- D. the range of $y = \log(x^2)$ is different from the range of $y = 2 \log x$

23. The expression $\log_5 25^k$ is equal to

A. $2k$

B. k^2

C. $25k$

D. 25^k

24.

The atmospheric pressure P , in kilopascals (kPa), at a distance d , in kilometres above Earth, is given by the formula $P = 100(10^{-0.0542d})$. A particular plane is designed to fly safely when the atmospheric pressure is greater than 15 kPa. The plane can fly safely to a maximum height of

A. 15.5 km

B. 15.2 km

C. 10.9 km

D. 2.8 km

25.

The graph of $y = a^{x-2}$ has a y -intercept of

A. $\frac{1}{a^2}$

B. $-\frac{1}{a^2}$

C. $-a^2$

D. 2

26. The point (64, 4) lies on the graph of $y = \log_b(x)$. If the point (2, k) lies on the graph of $y = b^x$, then the value of k is

- A. 8
C. 32
- B. 16
D. 256

27. If $\log_b a = 0.82$, then the value of $\log_b\left(\frac{b}{a}\right)$, correct to the nearest hundredth, is _____.

28. Given that $\log_b 64 = 3/2$, the value of b is

- A. 16
C. 96
- B. $42 \frac{2}{3}$
D. 512

29.

If $\log_5(125x) = 25$, then the value of x is

- A.** 5^{28}
- B.** 5^{22}
- C.** $5^{\frac{25}{3}}$
- D.** 5

30.

A student wants to use a graphing calculator to graph $y = \log_5 x$. If the calculator accepts only common logarithms, then an equivalent equation that could be used to obtain the graph is

- A.** $y = \frac{\log x}{\log 5}$
- B.** $y = \log x - \log 5$
- C.** $y = 5 \log x$
- D.** $y = \frac{\log x}{5}$

31. The half-life of phosphorus-32 is 14.3 days. The length of time that it will take 96.2 g of phosphorus-32 to decay to 12.5 g, to the nearest day, is

- A. 8 days
B. 26 days
C. 42 days
D. 52 days

32. If $\log_2 b = c$, then $\log_4 b$ equals

- A. $c/2$
B. c^2
C. $2c$
D. \sqrt{c}

33. In a geometric sequence, the first term is $2/81$ and the sixth term is $3/16$. The common ratio for this geometric sequence is

- A. $2/3$
B. $3/2$
C. 2
D. 3

34.

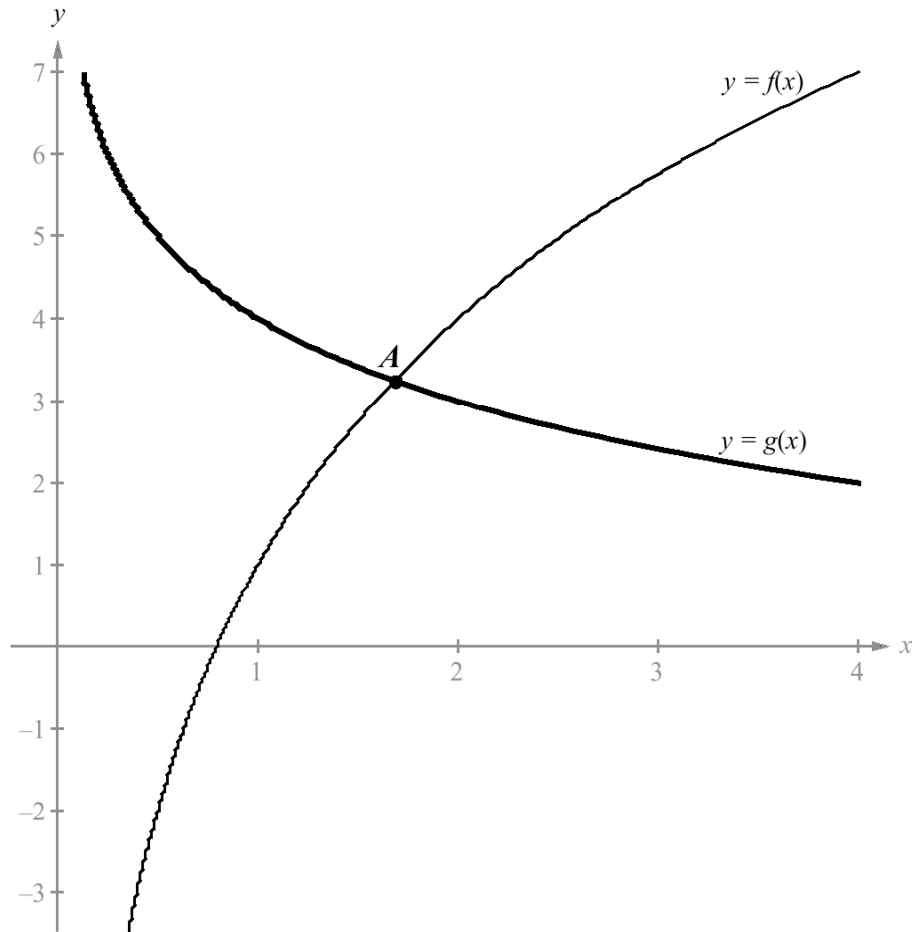
If $\log_x \frac{125}{27} = -\frac{3}{2}$, then the value of x is

- A.** $\frac{9}{25}$
B. $\frac{25}{9}$
C. $-\frac{9}{25}$
D. $-\frac{25}{9}$

35.

Use the following information to answer the next question.

The partial graphs of $f(x) = 1 + 3 \log_2 x$ and $g(x) = 4 - \log_2 x$ are shown below. The graphs intersect at point A .



Based on the information above, the x -coordinate of point A can be determined by solving

- A. $3 \log_2 x + 1 = 0$
- B. $4 - \log_2 x = 0$
- C. $\log_2 x = \frac{5}{2}$
- D. $\log_2 x = \frac{3}{4}$

36.

A mathematics class was asked to solve the equation

$$3^{x+2} = 6^x$$

The attempts of two students to solve the equation are shown below. Each student made one error that led to an incorrect solution.

Student A

$$3^{x+2} = 6^x$$

$$3^{x+2} = 3^{2x}$$

$$x+2 = 2x$$

$$2 = 2x - x$$

$$x = 2$$

Student B

$$3^{x+2} = 6^x$$

$$\log 3^{x+2} = \log 6^x$$

$$x+2 \log 3 = x \log 6$$

$$2 \log 3 = -x + x \log 6$$

$$2 \log 3 = x(-1 + \log 6)$$

$$\frac{2 \log 3}{(-1 + \log 6)} = x$$

x is approximately -4.3

- Show that neither $x=2$ nor $x=-4.3$ satisfies the original equation.
- Identify the error that was made by each student and state why each error leads to an incorrect answer.
- Solve the equation correctly. Give your answer to 2 decimal places, if necessary.

37.

In a nuclear disaster at Chernobyl in April 1986, approximately 12 600 kg of radioactive iodine-131 was released into the atmosphere. The half-life of iodine-131 is 8.04 days; therefore, after 8.04 days, half of the iodine-131 had decayed. The amount, $N(t)$, of iodine-131, in kg, remaining after t days is given by

$$N(t) = 12\,600 \left(\frac{1}{2}\right)^{\frac{t}{8.04}}$$

The approximate mass of iodine-131 remaining after 30 days was

- A. 70 kg
- B. 131 kg
- C. 420 kg
- D. 949 kg

38.

The expression $2 \log_a 5 + \log_a 6 - \frac{1}{3} \log_a 8$, $a > 0$, equals

- A. $\log_a 29$
- B. $\log_a 30$
- C. $\log_a 75$
- D. $\frac{8}{3} \log_a 3$

39.

A logarithmic form of $81^{\frac{3}{4}} = 27$ is

A. $\log_{27}\left(\frac{3}{4}\right) = 81$

B. $\log_{\frac{3}{4}}(27) = 81$

C. $\log_{27}(81) = \frac{3}{4}$

D. $\log_{81}(27) = \frac{3}{4}$

40.

If $\log_2(x) + 8 = 0$, then the value of x is

A. -3

B. $-\frac{1}{256}$

C. $\frac{1}{256}$

D. 3

41. The graph of $y = \log_4(x)$, where $x > 0$, lies entirely

A. above the x-axis

B. below the x-axis

C. to the left of the y-axis

D. to the right of the y-axis

42.

The value of $\sum_{n=1}^9 \log\left(\frac{n}{n+1}\right)$ is equal to

A. -1

B. $\log\left(\frac{45}{54}\right)$

C. $\log\left(\frac{35\,638}{5\,040}\right)$

D. $-1 + \log 9$

43.

In the equation $\log_{(x+2)} 5 = 10$, the value of x , correct to the nearest hundredth, is

A. -0.42

B. -0.83

C. -1.41

D. -1.50

44. The point $P(-1, 1/3)$ lies on the graph of the exponential function $f(x) = b^x$. The value of the base, b , of the exponential function, f , is

A. $1/3$

B. 3

C. $-1/3$

D. -3

45. The first term of a geometric sequence is 16, and the common ratio is $-1/2$. The sum of the first 7 terms of this sequence is

A. 114

B. 31.75

C. 10.75

D. 0.25

46. The value of $\sum_{k=5}^{15} (2^{k-1})$ is

A. 16 368

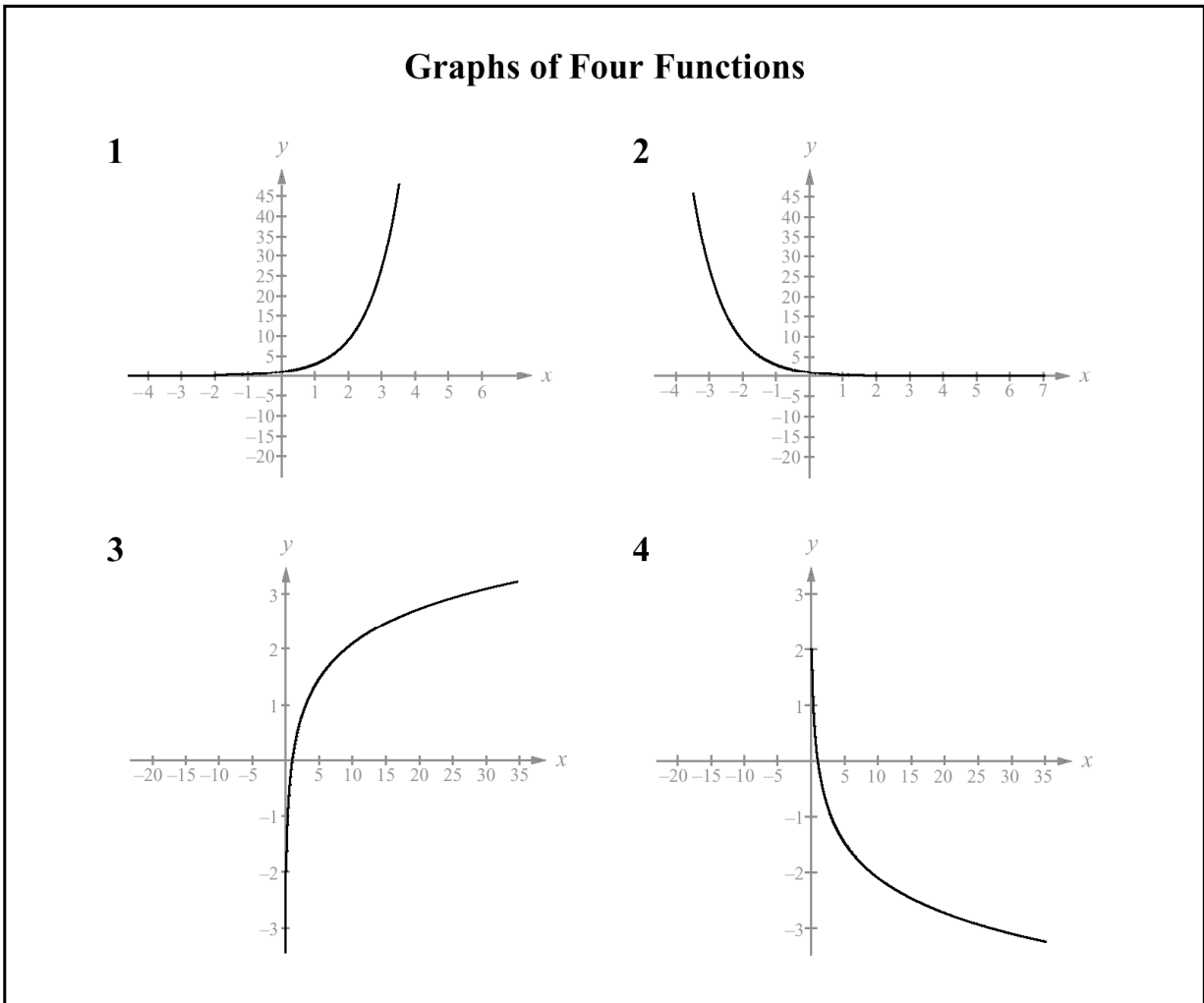
B. 16 383

C. 32 752

D. 32 767

47. How many terms are there in the series from question 46?

48.



Match each of the graphs, as numbered above, to the statement below that describes it.

- Graph # _____ represents an exponential function with a base between 0 and 1.
- Graph # _____ represents an exponential function with a base greater than 1.
- Graph # _____ represents a logarithmic function with a base between 0 and 1.
- Graph # _____ represents a logarithmic function with a base greater than 1.

49. Give an expression for the number of terms in the series: $\sum_{k=x}^y 5(1.4)^{k-2}$

- y
- $y-x$
- $y-x + 1$
- $y-x - 1$

50. Determine the common ratio of the infinite geometric sequence:

$$\log_2 a, \log_8 a, \log_{512} a, \dots \text{ where } a > 0$$

A. $1/3$

B. $1/2$

C. 3

D. 2

51. An earthquake in Vancouver measured 3.2 on the Richter scale. An earthquake in Tokyo measure 6.3 on the Richter scale. How many times as intense was the earthquake in Tokyo compared to the earthquake in Vancouver?

A. 3.10

B. 1.97

C. 93.01

D. 1258.93

52. An earthquake in Turkey is measured at 5.2 on the Richter scale. It is 2500 times stronger than an earthquake near Victoria. What is the measurement of the earthquake in Victoria?

A. 1.80

B. 1.63

C. 3.61

D. 2.70

53. Sound coming from a stereo speaker is measured at 124 dB. How many times stronger is this than the sound of a hair dryer, measured at 104 dB?

A. 10 times stronger

B. 100 times stronger

C. 200 times stronger

D. 16 times stronger

54. A certain radioactive element has a decay formula given by $A = A_0(0.75)^t$. Rewrite this formula with a base of 0.5 instead of 0.75.

A. $A = A_0(0.5)^t$

B. $A = A_0(0.75)^{\frac{t}{2}}$

C. $A = A_0(0.5)^{0.415t}$

D. $A = A_0(0.5)^{0.75t}$

55. Rewrite the above formula as a continuous growth equation, with base e .

56. Solve for x: $\log(5-x) + \log(5+x) = \log(16)$

A. $x=3$

B. $x=-3$

C. $x = \pm 3$

D. no solution

57. Determine the domain of the function $y = \log_x(5-x)$.

A. $x < 5$

C. $0 < x < 5$

B. $x < 5, x \neq 1$

D. $0 < x < 5, x \neq 1$

58. Solve algebraically:

$$2 \log_4(x) - \log_4(x+3) = 1$$

59.

Evaluate: $\log_2 \sqrt{8}$

A. $\sqrt{2}$

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

C. 3

D. 8

60.

Which expression is equivalent to $\log_5 30$?

A. $\log 6$

B. $\log 30 - \log 5$

C. $\frac{\log 5}{\log 30}$

D. $\frac{\log_2 30}{\log_2 5}$

61.

Express $\frac{1}{2} \log a - \log b - \log c$ as a single logarithm.

A. $\log\left(\frac{\sqrt{a}}{bc}\right)$

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

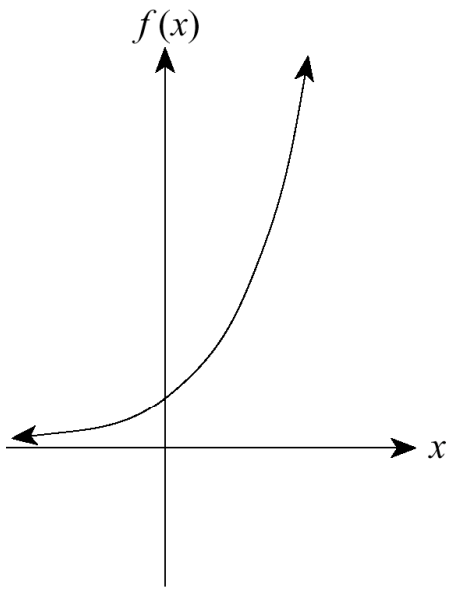
C. $\log\left(\frac{1}{2} a - b - c\right)$

D. $\log\left(\frac{a}{2bc}\right)$

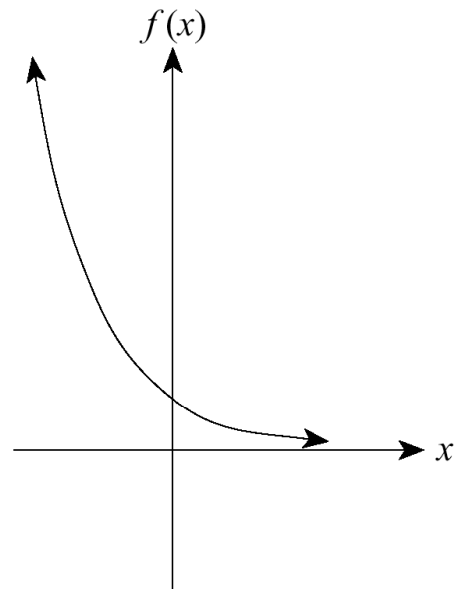
62.

Which graph best represents the function $f(x) = 2^{\pm x}$?

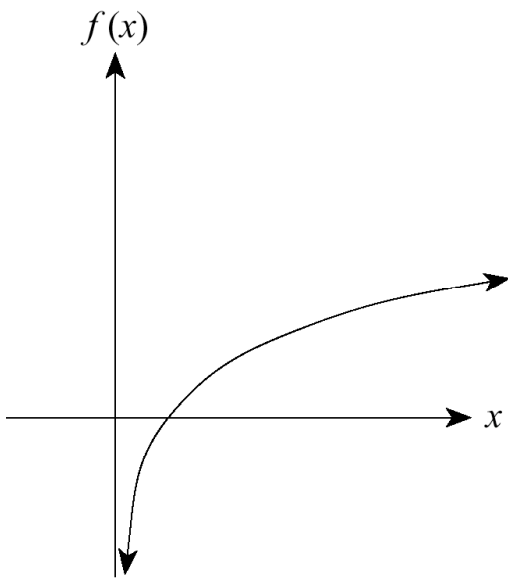
A.



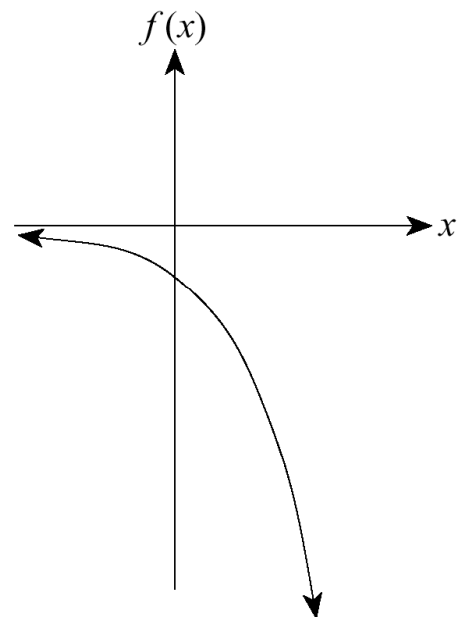
B.



C.



D.



63.

Solve for x : $\log_2 [\log_x (\log_3 9)] = -1$

- A. 2
- B. 3
- C. 4
- D. 5

64. Determine a single geometric mean between 9 and 25.

- A. $\sqrt{34}$
- B. 15
- C. 16
- D. 17

65. If the sum of an infinite geometric series is 9 and the first term is 6, determine the common ratio.

- A. $-1/3$
- B. $1/3$
- C. $2/3$
- D. $3/2$

66.

What restrictions for x exist for the equation $\log_x x + \log_x(2 - x) = 5$?

- A. $x > 0, \quad x \neq 1$
- B. $x < 2$
- C. $0 < x < 2$
- D. $0 < x < 2, \quad x \neq 1$

67. A city has a population of 15 000 and the population decreases by 8% per year. How many years will it take for the population to become 5 000? (accurate to 1 decimal place).

68.

Determine the logarithmic form of $4^x = 3$.

- A. $\log_3 x = 4$
- B. $\log_3 4 = x$
- C. $\log_x 4 = 3$
- D. $\log_4 3 = x$

69.

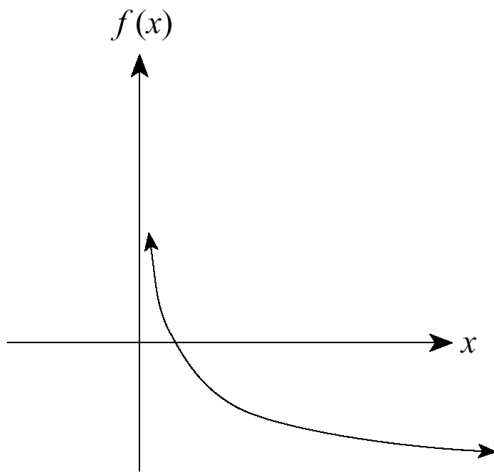
What is the value of x if $\log_5 x = 4$?

- A. $\sqrt[5]{4}$
- B. $\sqrt[4]{5}$
- C. 5^4
- D. 4^5

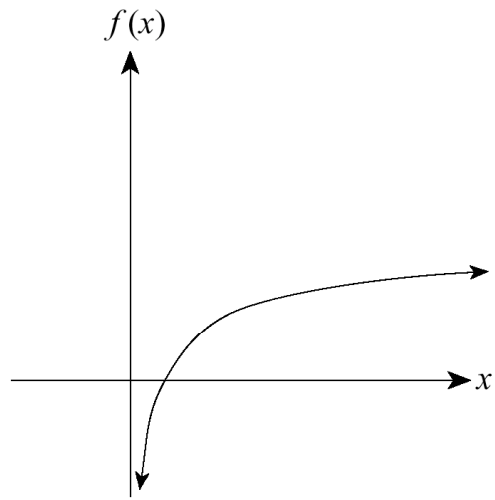
70.

Which graph **best** represents the function $f(x) = \log_3 x$?

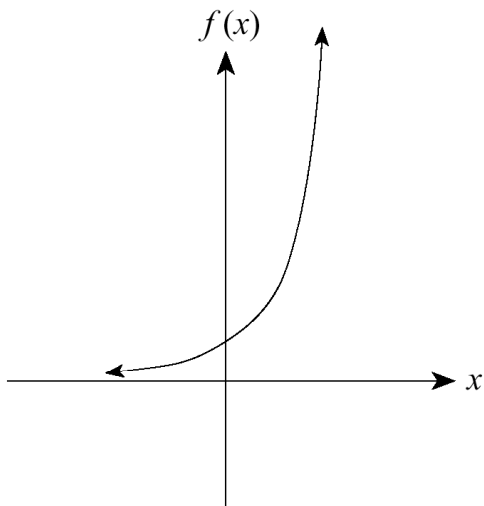
A.



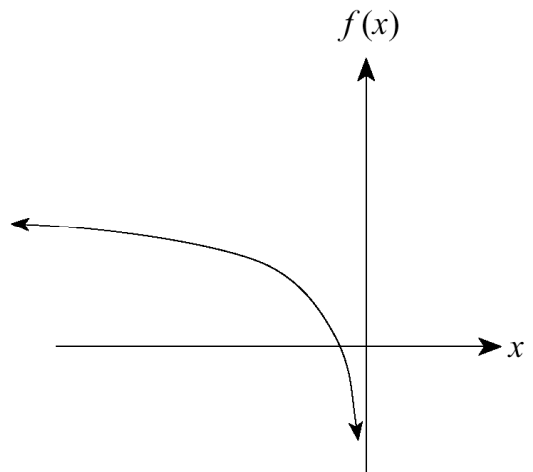
B.



C.



D.



71.

Evaluate: $-16 \log_2 \left(\frac{1}{8} \right)$

A. -4

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

C. 0

D. 48

72.

If $\log_5 x = 4.26$, what is the value of $\log_5 25x^2$?

- A. 2.66
- B. 3.80
- C. 8.26
- D. 10.52

73.

Simplify: $(\log_x y)(\log_y x)$

- A. 0
- B. 1
- C. $xy^{(x+y)}$
- D. $\log_{xy} (x + y)$

74.

Determine the values of x ($x \neq 0$) such that the following infinite geometric series has a finite sum.

$$1 + \frac{1}{4}x + \frac{1}{16}x^2 + \frac{1}{64}x^3 + \dots$$

- A. $x < \frac{1}{4}$
- B. $x > 4$
- C. $-4 < x < 4$
- D. $-\frac{1}{4} < x < \frac{1}{4}$

75.

Solve for x : $\log_5(2x + 1) = 1 - \log_5(x + 2)$

76. Evaluate $\log_5(15)$ (Accurate to 2 decimal places)
- A. 0.70
 - B. 1.17
 - C. 10.48
 - D. 1.68

77. If the graph of $y=a^x$ goes through the point (4, 625), determine the value of a.
- A. $1/5$
 - B. 5
 - C. -5
 - D. ± 5

78. Determine the domain of the function $y=\log_4(2x+4)$
- A. $x > 4$
 - B. $x < 4$
 - C. $x > 0$
 - D. $x > -2$

79.

Determine an expression for x , if $\log x = \log a - 2 \log b + \frac{1}{4} \log c$.

- A. $\frac{a}{b^2 \sqrt[4]{c}}$
- B. $\frac{a \sqrt[4]{c}}{b^2}$
- C. $\frac{a}{c^4 \sqrt{b}}$
- D. $\frac{ac^4}{\sqrt{b}}$

80. A radioactive material decays according to the formula $A = A_0 10^{-kt}$, where A is the final amount, A_0 is the initial amount, and t is the time in years. Find k, if 600 grams of this material decays to 475 grams in 8 years. (Accurate to 4 decimal places)

81.

If $a = b^{c \log_b d}$, then which of the following **must** be true?

- A. $a = cd$
- B. $a = b^c$
- C. $a = d^c$
- D. $a = dc$

82. Solve: $\pi^{2\log_{\pi} x + \log_{\pi} x} = 125$

- A. 2
B. 3
C. 5
D. 3.1416

83.

Determine the point where the asymptotes of the graphs $y = b^{x-1} + 2$ and $y = \log_b(x-1) + 2$ intersect.

- A. (1, 1)
B. (1, 2)
C. (2, 1)
D. (2, 2)

84. Determine the number of terms in the series $\sum_{k=7}^{57} (k+1)^2$

- A. 49
B. 50
C. 51
D. 52

85.

The sum of the first four terms of a geometric series with a first term of 5 is given by $S_4 = \frac{5(1-3^4)}{1-3}$. Determine the common ratio r .

- A. -3
B. 3
C. 4
D. 5

86.

Evaluate: $\sum_{k=3}^{\infty} 12\left(-\frac{2}{3}\right)^{k-1}$

- A. $\frac{36}{5}$
B. $\frac{16}{5}$
C. 16
D. 36

Scholarship Questions! Nasty, with big fangs, and sharp teeth! Be careful!

87.

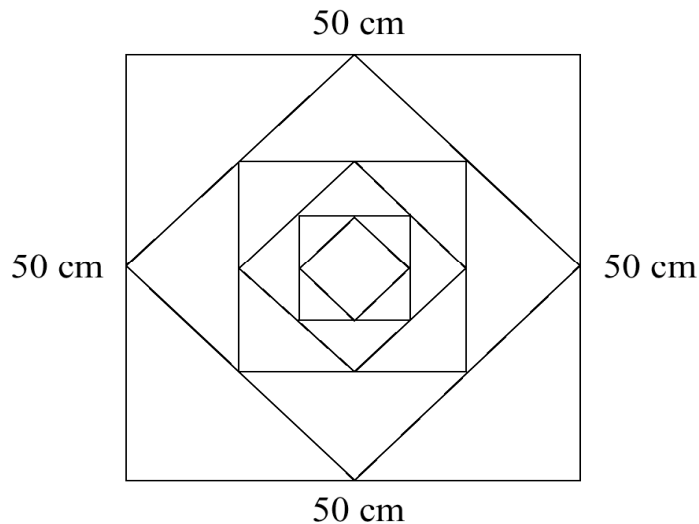
Solve: $\log_2(2 - x) + \log_2(1 - x) = \log_2(x + 4) + 1$

88. The sum of the first three terms of a geometric sequence is -14, while the second term is 12. Find all such sequences.

89.

Solve: $(\log_2 x)^2 - 2 \log_2 x - 8 = 0$

90. Each side of a square is 50 cm long. A second square is inscribed in the original square by joining the midpoints of the sides of the original square. This process is repeated over and over again.



a) Find the perimeter of the sixth square. (Give an answer that is exact **or** accurate to 2 decimal places).

b) If this process is continued indefinitely, find the sum of the perimeters of **all** the squares. Give your answer accurate to 2 decimal places.

91.

If $f(x) = 2 \log_3 x + 1$, find $f^{-1}(x)$.

92. An infinite geometric series has the property that the sum of any two consecutive terms is equal to the sum of all the terms that follow these two terms.

a) Determine all possible values for the common ratio r .

b) If the fifth term is 8, find the value(s) of the first term.

93. There are two infinite geometric series that have a 4th term of -8 and an 8th term of $-\frac{128}{81}$. Find the sum of each series.

94.

Solve: $4(\log_2 x)^4 - 7(\log_2 x)^2 + 3(\log_2 x) = 0$ (Give answers that are exact **or** accurate to 2 decimal places.) **(5 marks)**

95.

A population of rabbits increases by 90% every 6 months. At the present time there are 200 rabbits. How many **years** will it take for the population to reach 1 000 000 rabbits? (Accurate to 2 decimal places.) **(5 marks)**

96.

A geometric sequence has all positive terms. The sum of the first 2 terms of this geometric sequence is $\frac{20}{3}$. The sum of the reciprocals of the first 2 terms is $\frac{5}{8}$. Find all possibilities for the first term of the sequence. **(5 marks)**

97.

Solve for x :

$$\sum_{k=1}^2 4(x)^{k-2} + \sum_{k=1}^{\infty} -4(x)^{k-1} = 10$$

98. a) State all restrictions on the value of x if $\frac{2\log x}{3+\log x} = \frac{-2\log x}{3-\log x}$

b) Solve the above equation for x .

99. Solve for x: $8^{\log_2 x} - 25^{\log_5 x} = 4x - 4$

100. Solve for x: $\log_3 x + \log_9 x = 6.5$, accurate to 2 decimal places.

Answers:

- | | | |
|--------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 1. c | 38. c | 73. b |
| 2. d | 39. d | 74. c |
| 3. b | 40. c | 75. $x = 1/2$ (reject -3) |
| 4. d | 41. d | 76. d |
| 5. a | 42. a | 77. d |
| 6. b | 43. b | 78. d |
| 7. c | 44. b | 79. b |
| 8. (.3869, 1.5296) | 45. c | 80. $k = 0.0127$ |
| 9. b | 46. c | 81. c |
| 10. 0.27 | 47. 11 | 82. c |
| 11. c | 48. a) 2 b) 1 c) 4 d) 3 | 83. b |
| 12. b | 49. c | 84. c |
| 13. b | 50. a | 85. b |
| 14. a | 51. d | 86. b |
| 15. b | 52. a | 87. $x = -1$ (reject 6) |
| 16. a | 53. b | 88. -8, 12, -18 or -18, 12, -8 |
| 17. a | 54. c | 89. $x = 16$ or $x = 1/4$ |
| 18. d | 55. $A = A_0 e^{-0.288t}$ | 90. a) $\frac{50}{\sqrt{2}}$ b) 682.84 |
| 19. 20 | 56. c | |
| 20. c | 57. d | 91. $f^{-1}(x) = 3^{\frac{x-1}{2}}$ |
| 21. c | 58. $x = 6$ (reject -2) | 92. a) $\pm\sqrt{\frac{1}{2}}$ b) 32 |
| 22. b | 59. b | |
| 23. a | 60. d | 93. -81 or 16.2 (hint: $r = \pm\frac{2}{3}$) |
| 24. b | 61. a | |
| 25. a | 62. There is a typo on this question. It should read $f(x) = 2^{-x}$, and the answer is b. | 94. $x = 1, 2, \sqrt{2}, \frac{1}{2\sqrt{2}}$ |
| 26. a | | |
| 27. 0.18 | 63. c | |
| 28. a | 64. b | 95. 6.63 years |
| 29. b | 65. b | 96. $a = 4$ or $a = 8/3$ (hint: set up a system, and use substitution!) |
| 30. a | 66. d | 97. $x = 1/3$ (reject 2) |
| 31. c | 67. $t = 13.2$ years | 98. a) $x > 0, x \neq .001, x \neq 1000$
b) $x = 1$ |
| 32. a | 68. d | 99. $x = 1$ |
| 33. b | 69. c | 100. $x = 116.82$ |
| 34. a | 70. b | |
| 35. d | 71. d | |
| 36. c) $x = 3.17$ | 72. d | |
| 37. d | | |

Note to teachers:

The questions here come from a variety of sources. Some come from Alberta provincial exams, or are based on questions from those documents. The scholarship questions at the end come from the BC scholarship exams from 1991 to 1996. Most of the multiple choice questions are based on provincial exams from 1994-1996, but I have tried to change the numbers where formatting was not too large an issue. I also included some questions involving continuous growth and base e .

I generally hand this out at the beginning of the unit (including the answer key), and I collect it the day of the test. I flip through the booklet just to see if there is writing on each page, and I give the students a few marks. During the unit, I have a few photocopied solution manuals (showing all my steps) floating around the class as well. Students can sign them out and take them home if they wish.

If you find any errors in the answer key, or have any suggestions that I could add, feel free to email me at kdueck@sd42.ca and I'll be happy to reply.

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