

Math 3201 Assignment Unit 6 Winter 2020 Name: _____

Multiple Choice

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

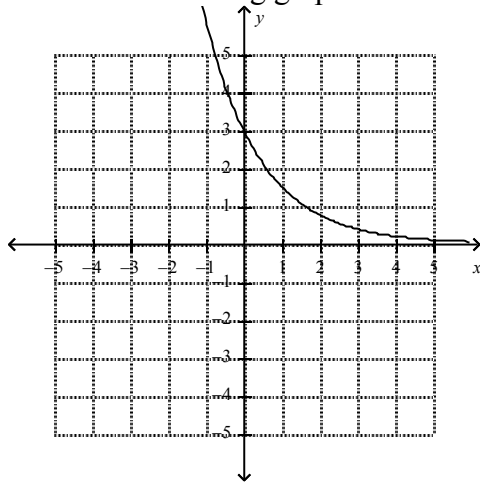
_____ 1. How many x -intercepts does the exponential function $f(x) = 2(10)^x$ have?

- A. 0
- B. 1
- C. 2
- D. 3

_____ 2. Which of the following is an exponential function?

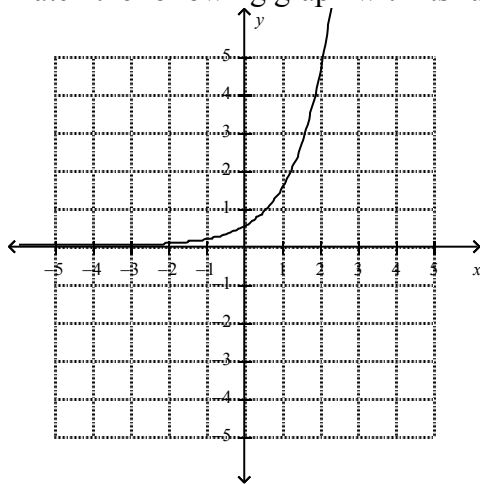
- A. $f(x) = x^2$
- B. $g(x) = (-1)^x$
- C. $h(x) = 17^x$
- D. $j(x) = 2^3 - x$

_____ 3. Match the following graph with its function.



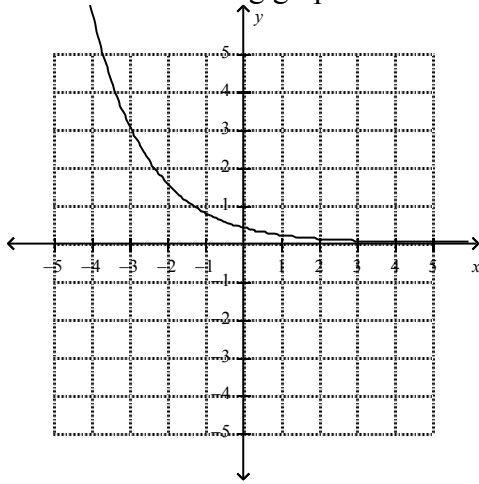
- A. $y = 3(0.5)^x$
- B. $y = 2(1.25)^x$
- C. $y = 0.5(3)^x$
- D. $y = 2(0.75)^x$

_____ 4. Match the following graph with its function.



- A. $y = 3(0.5)^x$
- B. $y = 2(1.25)^x$
- C. $y = 0.5(3)^x$
- D. $y = 2(0.75)^x$

5. Match the following graph with its function.



- A. $y = \frac{4}{5}(2)^x$
- B. $y = \frac{1}{2}(2)^x$
- C. $y = \frac{2}{5}\left(\frac{1}{2}\right)^x$
- D. $y = \frac{5}{2}\left(\frac{1}{2}\right)^x$

6. 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

7. Determine the y -intercept of the exponential function $j(x) = a(b)^x$, if $a > 0$, $b > 0$.

- A. 0
- B. 1
- C. a
- D. b

8. Which option best describes the behaviour of the exponential function $f(x) = 4\left(\frac{1}{2}\right)^x$?

- A. increasing because $a > 1$
- B. decreasing because $0 < a < 1$
- C. increasing because $b > 1$
- D. decreasing because $0 < b < 1$

9. 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}

- _____ 10. Solve the following exponential equation by writing both sides with the same base.

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

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

- _____ 11. Solve the following exponential equation by writing both sides with the same base.

$$5(4)^{z+2} = 5120$$

- A. $z = 0$
- B. $z = 1$
- C. $z = 2$
- D. $z = 3$

- _____ 12. Solve the following exponential equation by writing both sides with the same base.

$$3^{4a} = \sqrt{243}$$

- A. $a = \frac{3}{4}$
- B. $a = \frac{5}{8}$
- C. $a = \frac{9}{16}$
- D. $a = \frac{7}{8}$

- _____ 13. The population of a specific bacteria growing in a Petri dish is modelled by the function

$P(t) = 5000(2)^{\frac{t}{3}}$ where $P(t)$ represents the number of bacteria and t represents the time, in days, after the initial time. How long does it take for the population to double? [Note the initial population is when $t = 0 = y$ -intercept]

- A. 1 day
- B. 2 days
- C. 3 days
- D. 9 days

- _____ 14. The following data set involves exponential growth. Determine the missing value from the table.

x	0	1	2	3	4	5	6	7
y	3	6	12	24	48		192	384

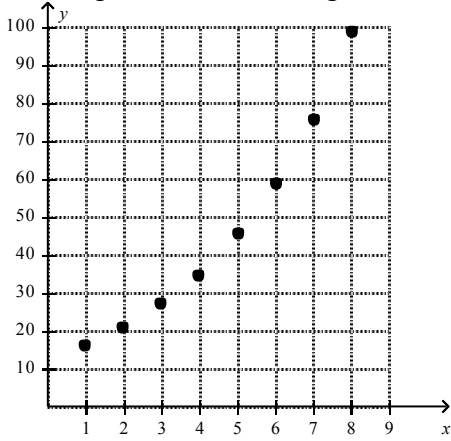
- A. 72
- B. 96
- C. 104
- D. 144

- _____ 15. The following data set involves exponential decay. Determine the missing value from the table.

x	-3	-2	-1	0	1	2
y	500.00	100.00		4.00	0.80	0.16

- A. 16.00
- B. 20.00
- C. 24.00
- D. 40.00

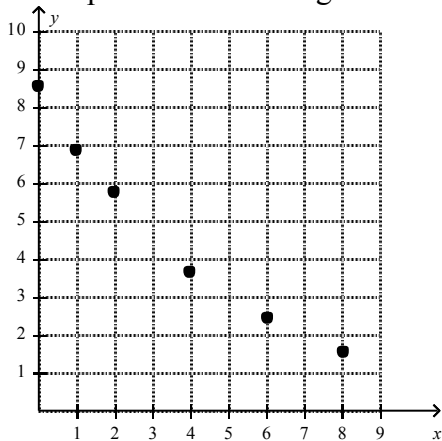
16. A scatter plot is drawn using a data set.



Identify the equation of the better curve of best fit.

- A. $y = 12(1.3)^x$
- B. $y = 12(0.3)^x$
- C. $y = 4(1.5)^x$
- D. $y = 4(0.5)^x$

17. A scatter plot is drawn using a data set.



Identify the equation of the best curve of best fit.

- A. $y = 4.8(1.08)^x$
- B. $y = 4.8(0.81)^x$
- C. $y = 8.4(0.81)^x$
- D. $y = 8.4(1.08)^x$

18. The equation of the exponential function that models a data set is $y = 78.20(0.87)^x$. Interpolate (this means predict or estimate) the value of y when $x = 5.5$.

- A. 36.35
- B. 46.49
- C. 22.50
- D. 38.98

19. The equation of the exponential function that models a data set is $y = 6.8(1.03)^x$. Determine the range of this function.

- A. $\{y \mid y > 0, y \in \mathbb{R}\}$
- B. $\{y \mid y \in \mathbb{R}\}$
- C. $\{y \mid y > 6.8, y \in \mathbb{R}\}$
- D. $\{y \mid y > 1.03, y \in \mathbb{R}\}$

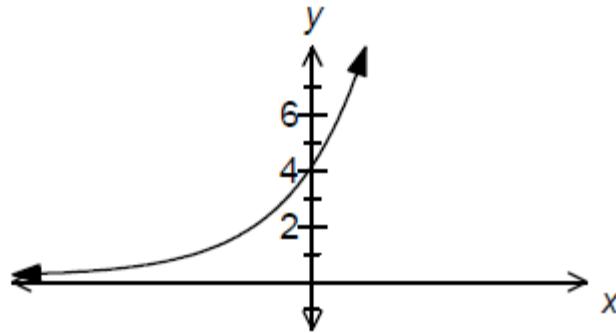
- _____ 20. An investment can be modelled by the following growth function, where x represents the time in years:
 $y = 2500(1.018)^x$
What was the principal (initial amount) invested?
- A. \$1250
 - B. \$2500
 - C. \$18
 - D. \$1018
- _____ 21. An investment can be modelled by the following growth function, where x represents the time in years:
 $y = 2500(1.018)^x$
What was the annual interest rate for the investment?
- A. 25%
 - B. 1.018%
 - C. 18%
 - D. 1.8%
- _____ 22. An investment can be modelled by the following growth function, where x represents the time in years:
 $y = 2500(1.018)^x$
Determine the value of the investment after 4 years.
- A. \$2684.92
 - B. \$2680.00
 - C. \$2683.24
 - D. \$2677.25
- _____ 23. Eli invested \$1000 at 3%/a compounded quarterly.
Define an exponential growth function for this investment in the form $A(n) = P(1 + i)^n$ where n represents the number of compounding periods.
- A. $A(n) = 1000(1.003)^n$
 - B. $A(n) = 1000(1.0075)^n$
 - C. $A(n) = 1000(1.03)^n$
 - D. $A(n) = 4000(1.03)^n$
- _____ 24. Aaron invested \$2400 at 4.8%/a compounded monthly.
Define an exponential growth function for this investment in the form $A(n) = P(1 + i)^n$ where n represents the number of months.
- A. $A(n) = 2400(1.048)^n$
 - B. $A(n) = 200(1.048)^n$
 - C. $A(n) = 2400(1.004)^n$
 - D. $A(n) = 200(1.004)^n$

Which is a decreasing exponential function?

- (A) $f(x) = \frac{1}{3}\left(\frac{5}{2}\right)^x$
- (B) $f(x) = 0.5(1.5)^x$
- (C) $f(x) = \frac{3}{2}(1)^x$
- (D) $f(x) = 2\left(\frac{3}{4}\right)^x$

___ 25.

Which exponential function best represents the graph shown?



- (A) $f(x) = \left(\frac{1}{4}\right)^x$
- (B) $f(x) = (4)^x$
- (C) $f(x) = 4\left(\frac{1}{4}\right)^x$
- (D) $f(x) = 4(4)^x$

___ 26.

The population of a strain of bacteria growing in a Petri dish is modeled by the function $P(t) = 3000(2)^{\frac{t}{4}}$ where $P(t)$ represents the number of bacteria and t represents the time in hours after the initial count. How much time will it take for the number of bacteria to reach 12 000?

- (A) 4 h
- (B) 8 h
- (C) 16 h
- (D) 32 h

___ 27.

Solve for x : $2^{3x+1} = 4^{2x-1}$

- (A) -3
- (B) -2
- (C) 2
- (D) 3

___ 28.

Short Answer

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

$$(2)^{-x-6} = \frac{1}{128}$$

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

$$\sqrt{1000} = 10^{2x-1}$$

3. Solve x: A) $4^{x-1} = 128^{1-2x}$ (6)

B) $\left(\frac{1}{16}\right)^{-x-1} = 2^{x+1}$ (6)

C) $125^{x-4} = \sqrt[3]{25} \cdot 5^{2x}$ (7)

4. Determine the equation of the exponential regression function for the data. Round all values to the nearest hundredth. (You can use regression if you like...round to two decimals) Use your equation to predict what y will be for $x = 7.5$.

x	1	2	3	4	5	6
y	154	194	243	310	388	488

Equation: _____

Prediction: _____ Show algebraically.

5. The fish population in Loon Lake is modelled by the equation $P(t) = 2500(0.92)^t$ where $P(t)$ represents the number of fish and t represents the time, in years, since 2012.

Fill in the table:

T	0 (Year=)	1 ()	2 ()	3	4	5
P(t)						

A) Estimate the fish population in 2030.

Model:

6. Johnny recently spent \$16 500 on a new car. He read that the depreciation rate for this model of car is 18% per year. How much money is Johnny's car worth in 6 years?

Model: _____ IN 6 years:

Long Answer for the Public Exam

1. Using the model $A = P(1 + i)^n$ answer the following:

Nora is about to invest \$5000 in an account that pays 6% interest a year compounded monthly for the next 3 years. A different financial institution offers 6.5% interest a year compounded semi-annually for the next 3 years. Write a function that models the growth of Nora's investment for each situation. Should Nora invest her money in this financial institution instead? Explain why or why not.

Model (First bank)

Model (other financial institution)

• • • • •

Amount after 3 years:

Amount after 3 years:

2. The population of a town can be modelled by the exponential equation $y = 5860(1.018)^x$ where y represents the number of people and x represents the time, in years, after 2010.

a) Is the population of the town increasing or decreasing? Explain how you know.

b) What does the constant term represent? Explain.

c) Estimate the population of the town in 2015. Show your work.

3. Algebraically solve the equation. Show your work.

$$\sqrt{243^x} = 3^{2x-1}$$

4. Solve the equation and verify your answer by substitution. Show your work.

$$8^{x+1} = 32^{x-1}$$

5. Thorium-227 has a half-life of 18.4 days. The remaining amount of a 50-mg sample of thorium-227 can be modelled by the equation

$$A(t) = 50 \left(\frac{1}{2} \right)^{\frac{t}{18.4}}$$

where $A(t)$ is the amount of thorium-227 remaining, in milligrams, and t is the time in days.

a) Determine the amount of thorium-227 remaining after 10 days, to the nearest milligram. Show your work.

b) Using $A(t) = 50 \left(\frac{1}{2} \right)^{\frac{t}{18.4}}$ algebraically determine how long it will take to decay to 6.25 mg.

c) Using $A(t) = 50\left(\frac{1}{2}\right)^{\frac{t}{18.4}}$ algebraically determine how long it will take to decay to one quarter of its original amount.

d) Using $A(t) = 50\left(\frac{1}{2}\right)^{\frac{t}{18.4}}$, algebraically determine how long it will take to decay to 3.125 mg.

6. The number of yeast cells in a sample is modelled by the function $N(t) = 250(2)^{\frac{t}{3}}$ where $N(t)$ represents the number of yeast cells and t represents the time, in hours.

a) Determine the amount present after half of a day. Show workings.

b) Using the model, $N(t) = 250(2)^{\frac{t}{3}}$, algebraically determine how long it will take to grow to 128,000 cells.

c) Using the model, $N(t) = 250(2)^{\frac{t}{3}}$, algebraically determine how long will it take to reach 512,000 yeast cells.

6 \$5000 is invested at a rate of 4.8% per for 10 years. Using $A = P(1 + i)^n$ How much money would you have in the bank if the interest rate is compounded as follows:

A) Yearly: Model= Ans:

B) Semi-annually Model= Ans:

C) Quarterly Model= Ans:

D) Monthly Model= Ans:

End

