Unit 4 - Coach Book

Unit 4 Assessment • Modeling and Analyzing Exponential Functions

1. Marco deposited $300 in a bank account after speaking to a bank representative. The representative showed Marco the exponential equation by which the balance of his account will be determined as it accumulates interest over time. The equation is shown below.

$$f(t) = 300 \cdot 1.03^t$$

What does the value 1.03 represent?

A. the initial amount of money deposited in the account

B. the dollar amount that will be added to the account each year

C. the factor by which the amount of money in the account is multiplied each year

D. the exponent to which the amount of money in the account is raised each year

2. Assume $f(x) = g(x)$. Which of the following pairs of functions may be used to represent the equation $3^{x+2} = 7x + 6$?

function Notation

A. $f(x) = x + 2$; $g(x) = 7x + 6$

B. $f(x) = 3^{7x+6}$; $g(x) = 7(3^{x+2}) + 6$

C. $f(x) = 3^{x+2}$; $g(x) = 7x + 6$

D. $f(x) = 7^{x+2}$; $g(x) = 3x + 6$

4. Which is equivalent to $x^{\frac{7}{3}}$?

A. $x \cdot \sqrt[3]{x^2}$

B. $x^2 \cdot (\sqrt[3]{x})$

C. $\sqrt[7]{x^3}$

D. $3x \cdot \sqrt[7]{x^2}$

$$\frac{7}{3} = 2\frac{1}{3}$$

$$(x^2)(x^{\frac{1}{3}})$$

$$= x^2 \cdot \sqrt[3]{x}$$

4

5. To teach Miguel about saving money, his father told him that he would hold some of Miguel's money and double the amount each year, x, but he would only hold it so long as the amount was still under \$100. If Miguel gives his father \$1 and his father doubles the money each year, so long as the doubled amount is below \$100, which inequality could Miguel use to track the amount of money?

< 100

A. $1 \cdot x^2 < 100$
B. $1 \cdot x^2 > 100$ — not exponential function
C. $1 \cdot 2^x < 100$
D. $1 \cdot 2^x > 100$

$1(2)^x < 100$

6.   Yolanda bought a new car for $8,000. She knows that if she takes good care of the car, its value will decrease by only 10% each year. After a certain number of years, the car will be worth $5,832. According to the formula $8,000 \cdot 0.9^t = 5,832$, how many years, t, will it take for the car's value to decrease to $5,832?

A.   1 year

B.   2 years

C.   3 years

D.   4 years

put $8000(0.9)^t$ in Calculator and look for the x-value that gives $5,832$ y-value

7. A local newspaper said that the city of Luttrell is expected to grow by 4% each year. The population in 2012 is 130,457 people. Let t represent the number of years after 2012. Which equation could be used to determine the total expected population, L, of Luttrell in t years?

growth

$$y = a(1+r)^t$$

    A. $L = 130{,}457 + 1.04t$

    B. $L = 130{,}457 \cdot 1.04^t$

    C. $L = 130{,}457t + 1.04t$

    D. $L = 130{,}457^{1.04t}$

8. Yoshi plans to open a savings account with $2,000. He compares the savings account plans at two banks. Each bank offers an annual interest rate of 8%. Bank A compounds the interest monthly, while Bank B compounds the interest annually. Which of the following function pairs can be used to find the projected values of these accounts after t years?

Bank A: n = 12

Bank B: n = 1

    A. $A(t) = 2000\left(1 + \dfrac{0.08}{12}\right)^{12t};$
           $B(t) = 2000(1.08)^t$

    B. $A(t) = 2{,}000(1.08)^{12t};$
           $B(t) = 2{,}000(1.08)^t$

    C. $A(t) = 2{,}000(12t + 0.08)^2;$
           $B(t) = 2{,}000(t + 0.08)^2$

    D. $A(t) = 2{,}000(1.08 + 12t);$
           $B(t) = 2{,}000(1.08 + t)$

10. The graph of the function $f(x) = 3^x - 1$ is displayed below.
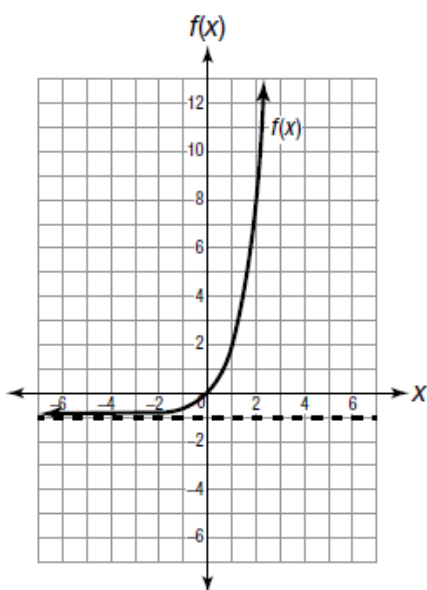
Which best describes the value of $f(x)$ as the independent variable x increases?

A. decreasing when $x < 0$ and increasing when $x > 0$

B. constantly increasing

C. constantly decreasing

D. neither increasing nor decreasing

13. Given the function $f(x) = 3^x - 2$, which of the
following is equivalent to $f(3)$?

A.   7

B.   9

C.   25

D.   27

$$f(3) = 3^3 - 2$$

$$f(3) = 27 - 2$$

$$f(3) = 25$$

14. Given this property of exponents:

$$a^m \cdot a^n = a^{m+n}$$

Which of the following must also be true?

~~A.~~ $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a^{\frac{2}{9}}$

B. $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a^{\frac{1}{3}}$

C. $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a^{\frac{2}{6}}$

(D.) $a^{\frac{2}{3}} \cdot a^{\frac{1}{3}} = a$

$$\frac{2}{3} + \frac{1}{3} = 1$$

15. Several input- and output- values of a function are shown in the table below.

x	f(x)
1	2
2	4
3	8
4	16
5	32

Which is the best interpretation of the average rate of change of this function?

A. As x increases by 1, f(x) increases by 2; therefore, f(x) is a linear function.

B. As x increases by 1, f(x) increases by 2; therefore, f(x) is an exponential function.

C. As x increases by 1, f(x) increases by a power of 2; therefore, f(x) is a linear function.

(D.) As x increases by 1, f(x) increases by a power of 2; therefore, f(x) is an exponential function.

16. Given that $(5^{\frac{1}{3}})^3 = 5$, what must be the value of $5^{\frac{1}{3}}$?

A. $3\sqrt{5}$

(B.) $\sqrt[3]{5}$

C. $(\sqrt[3]{5})^3$

D. $\frac{5}{3}$

$$5^{\frac{1}{2}} = \sqrt{5}$$

$$5^{\frac{1}{3}} = \sqrt[3]{5}$$

17. A company made $20,000 in revenue in one year. The president of the company determined that the company's revenue needs to increase by 10% each year to be successful. If t represents the number of years that have passed and R(t) represents the yearly revenue goal, which expression could the president of the company use to determine the revenue goal for any year?

A. $R(t) = 0.10t^{20,000}$

(B.) $R(t) = 20,000 \cdot 1.10^t$

C. $R(t) = 1.10 \cdot 20,000^t$

D. $R(t) = 20,000^{1.10t}$

$$y = a(1 + r)^t$$

$$y = 20000(1.1)^t$$

18. Doris decided to start a stamp collection. She hopes to triple the total number of stamps that she has in her collection each year. If she has 3 stamps when she starts her collection, which sequence represents the number of stamps she wants to have in her collection each year?

    A. 3, 9, 27, 54, 108, ...   *Recursive*
    B. 3, 9, 15, 21, 27, ... $a_n = a_{n-1} \cdot 3$
    C. 3, 6, 9, 12, 15, ...
    D. 3, 9, 27, 81, 243, ...

    $a_n = 3(3)^{n-1}$
    Explicit

19. A station wagon was purchased for $23,995 from a local dealership. Due to wear and tear, the value of the station wagon is expected to *depreciate* by 17% annually. If t represents the time, in years, since the station wagon was purchased, which of the following expressions describes the value of the station wagon t years after it was purchased?

    $y = a(1-r)^t$

    A. $23{,}995 \cdot 0.17^t$
    B. $23{,}995 \cdot 0.83^t$
    C. $23{,}995^{0.17t}$
    D. $23{,}995^{0.83t}$

20. In the geometric sequence shown below, a_n represents the nth term of the sequence.

a_n	Value
a_1	1
a_2	4
a_3	16
a_4	64
a_5	256

    What is the recursive formula of the geometric sequence?

    A. $a_n = (a_{n-1})^2$
    B. $a_n = a_{n-1} + 3$
    C. $a_n = 2a_{n-1}$
    D. $a_n = 4a_{n-1}$

    $r = 4$

    a_{n-1}
    previous term

21. Solve for x. Show all work.

$$2^{\frac{x}{2}} = 8\sqrt{2}$$

$$2^{\frac{x}{2}} = \sqrt{2^7}$$

$$2^{\frac{x}{2}} = 2^{\frac{7}{2}}$$

$$x = \underline{7}$$

$$8\sqrt{2} = \sqrt{8^2 \cdot 2}$$

$$\sqrt{2^7} = \sqrt{128}$$

128
2 · 64
2 · 32
2 · 16
2 · 8
2 · 4
2 · 2

25. Dina is trying to solve an exponential equation. The equation and the steps she used to find her solution are described below.

$$2^{12x+5} = 8^{2x+1}$$

Step 1: $2^{12x+5} = (2^4)^{2x+1}$

Step 2: $2^{12x+5} = 2^{8x+4}$

Step 3: $12x + 5 = 8x + 4$

Step 4: $4x + 1 = 0$

$$x = -\frac{1}{4}$$

A. Check Dina's solution to show that she is incorrect.

Handwritten work:

$2^{12x+5} = 8^{2x+1}$

$2^{12x+5} = 2^{3(2x+1)}$

$12x + 5 = 6x + 3$

$-6x \qquad -6x$

$6x + 5 = 3$

$-5 \quad -5$

$6x = -2$

$\frac{6x}{6} = \frac{-2}{6}$

$$\boxed{x = -\frac{1}{3}}$$

$$8 = 2 \cdot 2 \cdot 2 = 2^3$$

Factor tree: 8 → 2, 4 → 2, 2
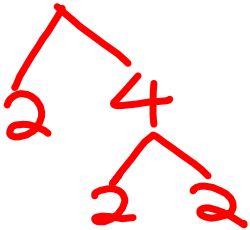
B. Find the mistake in Dina's work and explain why this step is incorrect.

Dina made a mistake in the 1st step. Instead of writing 8 as 2^3, she wrote 2^4.

C. Determine the solution of Dina's exponential equation and check to verify the answer. Show all work.

Solving Exponential Equations

$$2^{3x} = 2^{12}$$

$$3x = \frac{12}{3}$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$\boxed{X = 4}$$

Same base

Drop base

Set exponent equal
to each other
Solve for x.

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Unit 6 - No Calc. Review

High School HS Algebra
ALG_PS_EOC_NO_CALC_Unit_6

Name:_____   Block:_____

1. Solve for y.

$$\begin{cases} x + y = 1 \\ -2x + 3y = 13 \end{cases}$$

A) $x = 2$
B) $x = -2$
C) $x = 3$
D) $x = -3$

(MGSE9-12.A.REI.5) System Of Equations

(handwritten work): (5) (2) (2) $x + 3 = 1$ $x = -2$
$2x + 2y = 2$
$+(-2x + 3y = 13)$
$\dfrac{5y}{5} = \dfrac{15}{5}$
$y = 3$

2. Look at the sequence in the table. Which recursive formula represents the sequence shown?

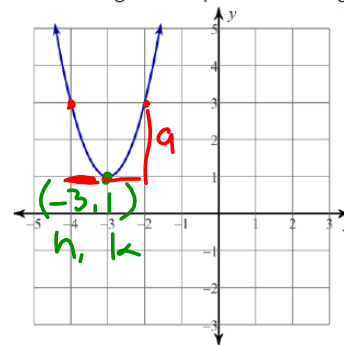| n	a_n
1	2
2	3
3	5
4	9
5	17

A) $a_n = a_{n-1} + 1$
B) $a_n = 3a_{n-1} - 3$
C) $a_n = 2a_{n-1} - 1$
D) $a_n = a_{n-1} + 8$

(MGSE9-12.F.IF.3) Recognize Sequences

(handwritten): a_{n-1} — previous term

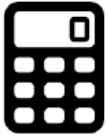3. Which of the following is the equation for the graph?

(handwritten): $(-3, 1)$ h, k

A) $y = 2(x - 3)^2 + 1$
B) $y = 2(x + 3)^2 + 1$
C) $y = (x + 3)^2 + 1$
D) $y = (x - 3)^2 + 1$

(MGSE9-12.F.IF.7) Graph Functions

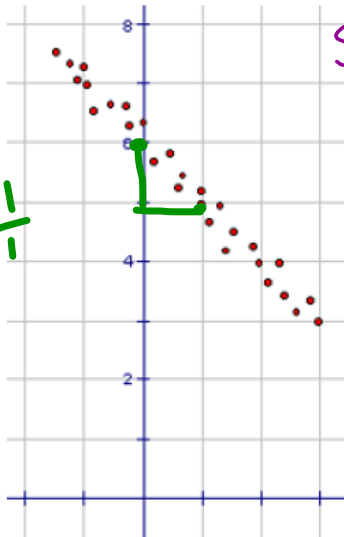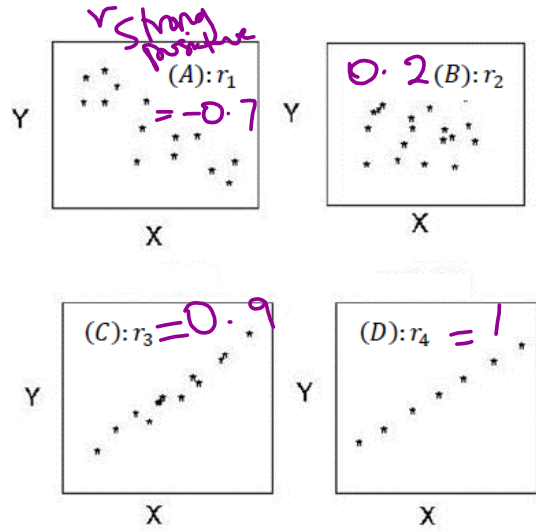# Unit 6 - Calc. Review

High School HS Algebra
ALG_PS_EOC_Unit_6

Name:_____   Block:_____

(handwritten number line: -1 ____ 0 ____ 1, with "r" and "Strong negative", "weak", "r Strong positive")

(handwritten: M = -1/1, b = 6)

4. Which equation best represents the line of best fit for the scatterplot?
A) y = x + 6
B) y = 2x + 6
C) y = -x + 6   *(circled)*
D) y = -2x + 6
(MGSE9-12.S.ID.6c) Fit Linear Function

6. The four scatterplots show correlations in four sets of data, where the correlation coefficients are $r_1, r_2, r_3,$ and r_4. Choose the correct statement.
A) $r_1 < r_2 < r_3 < r_4$ *(circled)*
B) $r_2 < r_3 < r_4 < r_1$
C) $r_3 < r_2 < r_4 < r_1$
D) $r_4 < r_2 < r_1 < r_3$
(MGSE9-12.S.ID.8) Compute And Interpret

(scatterplots handwritten labels: (A): r_1 = -0.7, (B): r_2 = 0.2, (C): r_3 = 0.9, (D): r_4 = 1)

linregtable

Hours, x	3	5	2	8	2	4	4	5	6	3
Scores, y	65	80	60	88	66	78	85	90	90	71

5. The data shown are the final exam scores of 10 randomly selected math students and the number of hours they studied for the exam. The equation of the line of best fit for this data is
A) y = 56.11x - 5.044
B) y = 5.044x + 56.11   *(circled)*
C) y = -56.11x - 5.044
D) y = 5.044x + 5.044
(MGSE9-12.S.ID.6a) Fit A Function

(handwritten: a = 5.044 — slope; b = 56.11 — y-int.)

Do you go to the movies at least twice a week?

	Yes	No	Total
Male	35	45	80
Female	67	28	95
Total	102	73	175

7. Jamie wants to find out how many students at her school go to the movies at least twice a week. She interviews 175 students and records their gender and a yes if they go at least twice a week and no if they go less than twice a week. She displays the results in the table.

What is the probability that a person who does not go to the movies at least twice a week is female (round to the thousandth)?
A) 0.160
B) 0.192
C) 0.295
D) 0.384   *(circled)*
(MGSE9-12.S.ID.5) Summarize Data

(handwritten: 28/73 = 0.384)

| Mrs. Cox	Mr. Jones
Hours Worked	Hours Worked
10	8
15	20
17	11
18	15
12	33
30	18
14	22
8	23
5	27
16	25

8. Mrs. Cox and Mr. Jones are in charge of the work-study program for Oak High School. Each teacher is in charge of supervising 10 students. They are comparing statistics for the two groups of students based on the hours worked per week. Which statement is true?

A) The mean for Mrs. Cox is greater than the mean for Mr. Jones.

B) The median for Mrs. Cox is greater than the median for Mr. Jones.

C) The Interquartile Range for Mrs. Cox is less than the Interquartile Range for Mr. Jones.

D) The Interquartile Range for Mrs. Cox is greater than the Interquartile Range for Mr. Jones.

(MGSE9-12.S.ID.3) Interpret Differences
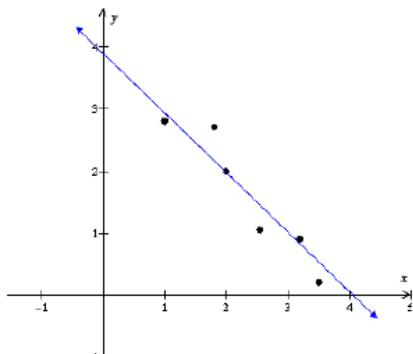
9. The scatterplot for a set of data points is shown, along with the line of best fit. Choose the BEST estimate for r, the correlation coefficient.

A) -1.0
B) -0.8
C) 0.8
D) 1.0

(MGSE9-12.S.ID.8) Compute And Interpret

Baseball Card Collection
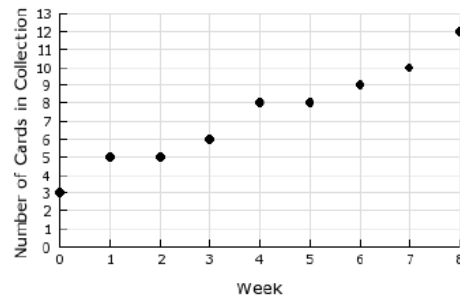
10. Which equation is the BEST fit for the data in the graph?

A) $y = x + 3$
B) $y = 2x + 1$
C) $y = 2x + 4$
D) $y = x + 5$

(MGSE9-12.S.ID.6c) Fit Linear Function

11. Victor, Vladimir, Venus, and Vivian each have a different set of data points. Each used the linear regression feature of his/her graphing calculator to find a linear function that models his/her data.

The value of the correlation coefficient (r) associated with Victor's function was –0.91, the value or r for Vladimir's function was 0.73, the value of r for Venus's function was –0.44, and the value of r for Vivian's function was 0.88.

Who has the BEST model for his or her data?
A) Venus
B) Victor
C) Vivian
D) Vladimir

(MGSE9-12.S.ID.8) Compute And Interpret

12. Olivia is growing roses and keeps track of how much fertilizer (in ounces) she adds to the soil and how many blooms each rose bush has. She finds a linear relationship that can be modeled by the equation $y = 1.345x + 4$. What does the 1.345 mean in the context of the problem?

A) That she must add 1.345 ounces of fertilizer every day.
B) That every day she found an additional 1.345 blooms on her rose bushes.
C) That for every additional bloom on the rose bush she added 1.345 ounces of fertilizer.
D) That for every ounce of fertilizer she adds there is an additional 1.345 blooms on the rose bush.

(MGSE9-12.S.ID.7) Interpret Slope

5 - # Summary — Box Plot

Min   Q1   Median   Q3   Max
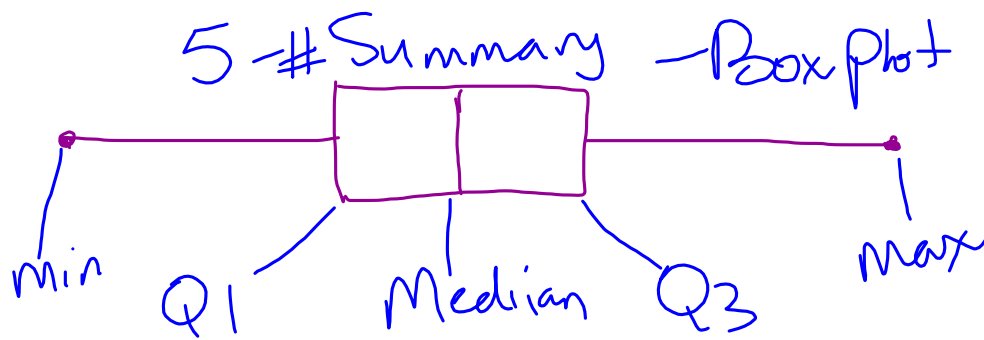
IQR: Interquartile Range
$$Q3 - Q1$$

Mrs. Cox

$n = 10$

$\overline{X} = 14.5$ (Mean)

Min = 5

Q1 = 10

Median = 14.5

Q3 = 17

Max = 30

IQR = 17 - 10

IQR = 7

Mr. Jones

$n = 10$

$\overline{X} = 20.2$

Min = 8

Q1 = 15

Med = 21

Q3 = 25

Max = 33

IQR = 25 - 15

IQR = 10

Calculator

① Data

② key in #s, enter

③ 2nd F, data

④ Select 1-Var, enter
4 times

⑤ Scroll down to get
information.

Video Games and Soda

	Drink Soda	Does Not Drink Soda
Play Video Games	13	7
Does Not Play Video Games	6	4

(handwritten: 19 11)

(handwritten: 20 10 30)

$$\frac{20}{30} = 0.67 = 67\%$$

13. Jordan interviewed her 30 classmates on whether or not they played video games and if they drink soda. She displayed her results in the two-way table shown. Which statement is true?

   A) About 67% of her classmates play video games.
   B) More than half of her classmates drink soda and play video games.
   C) There is a greater percentage of students who don't play video games then those who don't drink soda.
   D) The same percentage of students who don't play video games and don't drink soda as those who don't play video games and drink soda.

   (MGSE9-12.S.ID.5) Summarize Data

Hair Color	Boys	Girls	Total
Black	4	5	9
Blonde	4	6	10
Brown	10	8	18
Red	2	1	3
Total	20	20	40

14. The table shows the number of boys and girls that have black, blonde, brown, or red hair color.

   What portion of the boys have red hair? (round to nearest hundredth)

   A) 0.05
   B) 0.10
   C) 0.11
   D) 0.15

   $$\frac{2}{20} = 0.10$$

   (MGSE9-12.S.ID.5) Summarize Data