BECA/Huson/Algebra 2: Regents Preparation Name:
6 June 2024

Prep #24 Exponential regression

Casio instructions: `https://www.youtube.com/watch?v=jcX93Grn8o8`

Menu > Stat > enter data in List 1 and List 2
> Calc (F2) > REG (F3) > (F6) > EXP (F2) > abˆX (F2)

1. Consider the data in the table below.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

State an exponential regression equation to model these data, rounding all values to the *nearest thousandth*.

2. A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
$F(t)$	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

3. Kelly-Ann has \$20,000 to invest. She puts half of the money into an account that grows at an annual rate of 0.9%. At the same time, she puts the other half of the money into an account that grows continuously at an annual rate of 0.8%. Write an equation that represents the value of Kelly-Ann's investments after t years.

4. An investment of \$5000 grows at an annual rate of 3.5% compounded monthly.

$$P(t) = 5000(1 + \frac{0.035}{12})^{12t}$$

(a) Find the investment value after 10 years.

(b) Determine the time for the investment value to double, to the *nearest month*.

5. The table below gives air pressures in kPa at selected altitudes above sea level measured in kilometers.

x	Altitude (km)	0	1	2	3	4	5
y	Air Pressure (kPa)	101	90	79	70	62	54

Write an exponential regression equation that models these data rounding all values to the *nearest thousandth*.

Use this equation to algebraically determine the altitude, to the *nearest hundredth* of a kilometer, when the air pressure is 29 kPa.

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6. Expand and simplify each complex expression.

   (a) $6xi^3(-4xi + 5)$

   (b) $(x + 3i)^2 - (2x - 3i)^2$

7. Solve each equation. Express the answer in $a + bi$ form.

   (a) $2x^2 + 5x + 8 = 0$

   (b) $5x^2 - 2x + 13 = 9$

8. Find the solution set of each equation (round to the *nearest tenth*).

   (a) $\dfrac{2}{3x+1} = \dfrac{1}{x} - \dfrac{6x}{3x+1}$

   (b) $\dfrac{1}{1-x^2} = -|3x - 2| + 5$

9. Over the set of integers, factor completely $x^4 - 5x^2 + 4$.

10. Determine which expressions are equivalent to $\dfrac{x^4 - 5x^2 + 4x + 14}{x + 2}$.

    (hint: substitute $x = 0$ and $x = 1$)

    (a) $x^3 - 2x^2 - x + 6 + \dfrac{2}{x+2}$

    (b) $x^3 - 5x + 4 - \dfrac{14}{x+2}$

    (c) $x^3 + 2x^2 - x + 2 + \dfrac{18}{x+2}$

    (d) $x^3 + 2x^2 - 9x + 22 - \dfrac{30}{x+2}$

11. Given $a > 0$, solve the equation $a^{x+1} = \sqrt[3]{a^2}$ for x algebraically.

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12. Write a recursive formula for the sequence 1.45, 2.05, 2.55, 3.05, ...

13. Given the sequence beginning 4, 2, 1, $\frac{1}{2}$, ..., find the sum of the first 7 terms, rounded to the *nearest hundredth*.

14. The first two terms of an arithmetic sequence are shown in the table. Complete the table and write a recursive definition for the sequence.

n	1	2	3	4	5
a_n	3	9			

15. When a ball bounces, the heights of consecutive bounces form a geometric sequence. The height of the first bounce is 121 centimeters and the height of the third bounce is 64 centimeters. To the *nearest centimeter*, what is the height of the fifth bounce?

16. Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

17. Given $P(A) = \frac{1}{3}$ and $P(B) = \frac{5}{12}$, where A and B are independent events. Determine $P(A \cap B)$.

18. The set of data in the table below shows the results of a survey on the number of messages that people of different ages text on their cell phones each month.

Age Group	0-10	11-50	Over 50
15-18	4	37	68
19-22	6	25	87
23-60	25	47	157

If a person from this survey is selected at random, what is the probability that the person texts over 50 messages per month given that the person is between the ages of 23 and 60?

19. The scores on a collegiate mathematics readiness assessment are approximately normally distributed with a mean of 680 and a standard deviation of 120.

Determine the percentage of scores between 690 and 900, to the *nearest percent*.