

Prep #24 Exponential regression

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. Simplify each complex expression to the form $a + bi$, with real numbers a and b .

(a) $\frac{1}{2}(8 + 2i)(3\sqrt{-48}) =$

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

4. Solve each equation. Write your solution in $a + bi$ form.

(a) $x^2 - 3x + 6 = 0$

(b) $2x^2 - 6x + 7 = 0$

5. Solve each system of equations.

(a)

$$2x + 5y + 2z = -38$$

$$3x - 2y + 4z = 17$$

$$-6x + y - 7z = -12$$

(b)

$$3x - 9z = 33$$

$$7x - 4y - z = -15$$

$$4x + 6y + 5z = -6$$

6. Factor completely $2d^4 + 6d^3 - 18d^2 - 54d$.

7. Determine which expressions are equivalent to $\frac{x^3 + 2x^2 + x + 6}{x + 2}$.

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

(a) $x^2 + 3$

(c) $2x^2 + x + 6$

(b) $x^2 + 1 + \frac{4}{x + 2}$

(d) $2x^2 + 1 + \frac{4}{x + 2}$

8. Convert between radical and rational exponent forms. (assume $x > 0$)

(a) $\frac{(4x^2)^{\frac{5}{2}}}{x^3} =$

(b) $\frac{4\sqrt{x^5}}{\sqrt[4]{16x^2}} =$

9. Write an explicit formula for the sequence $\frac{27}{8}, \frac{9}{4}, \frac{3}{2}, 1, \dots$
10. Write a recursive formula for the sequence $1.45, 2.05, 2.55, 3.05, \dots$
11. Given the sequence beginning $4, 2, 1, \frac{1}{2}, \dots$, find the sum of the first 7 terms, rounded to the *nearest hundredth*.
12. 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 | | | |

13. Given events A and B , such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cap B) = 0.3$, determine whether A and B are independent or dependent.

14. 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?

15. The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?