

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10-15 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. The following table shows the number in millions graduating from high school in the United States in the given year:

Year	2001	2003	2005	2007
Number Graduating	2.85	2.98	3.11	3.24

- (a) Test whether the data of the number of high-school graduates versus year are linear.
- (b) If yes, find the slope of the linear model and explain in practical terms its meaning.
- (c) Find a formula for the linear function modeling the data. Make sure to explain the meaning of the variables that you used.
- (d) Express, using functional notation the number graduating from high school in 2010 and, then, calculate its value.
- (e) Assuming a continuation of the trend above, which year's graduating class will be the first to break the 5 million barrier? Show all work.

2. Find an equation for the line that is perpendicular to the line $x + 3y = 15$ and passes through the point $(-7, 13)$.

3. **Use the matrix method** to solve the system of equations

$$\left\{ \begin{array}{rcl} x - 3y + z & = & 0 \\ y - z & = & 3 \\ 3x - 7y + 2z & = & 4 \end{array} \right\}$$

4. The following table shows the balance of a savings account over the first 5 months since the account was opened.

Time in months	0	1	2	3	4	5
Savings Balance	1750.00	1771.00	1792.25	1813.76	1835.52	1857.55

- (a) How much was originally invested in the account?
- (b) Test to find out whether the data are exponential.
- (c) Find an exponential model for the balance versus time. Make sure to explain the meaning of the variables you choose.
- (d) What is the monthly interest rate and what is the annual interest rate? Explain showing all work.
- (e) How long does it take for the initial deposit to double in value? Show your work.

5. An ecologist studies the population of a certain species of animals in an ecosystem. She has collected the following data showing the population in thousands versus year.

Year	2003	2004	2005	2006	2007	2008
Population	5.25	5.93	6.59	7.47	8.28	8.99

- (a) Check whether population versus time follows an exponential trend.
- (b) Create an exponential model for the population versus time. Make sure to explain clearly the meaning of the variables that you choose.
- (c) What is the average annual growth rate? What is the annual percentage growth?
- (d) Overlay the graph of your model over the given data points and show both neatly. Make sure to label your axes.