1. Solve, using matrices:
\[
\begin{align*}
x - y + 5z &= 10 \\
2x + 3y + 4z &= -1 \\
-x + 4y - z &= -15
\end{align*}
\]

2. Solve the following linear programming problem.
Maximize: \( f = 7x + 6y \)
Subject to:
\[
\begin{align*}
x &\geq 0 \\
y &\geq 0 \\
x + y &\leq 27 \\
x + y &\leq 11 \\
2x + 5y &\leq 90
\end{align*}
\]

3. Set up as a linear programming problem—define variables, give objective function, list constraints (“subject to: …”) Do NOT solve.
A manufacturer plans to sell two models of home computers. Model A sells for $2800 and yields a profit of $500 on each while Model B sells for $3400 and gives a profit of $800 on each. The merchant estimates that the total monthly demand will not exceed 250 units and he does not want to invest more than $700,000 in computer inventory. Determine the number of units of each model that should be stocked in order to maximize profit.

4. Determine which of the following sequences are geometric. Explain why.
   a) \( 2, 7, 9, 3, 1, \ldots \)  
   b) \( 18, 7, 42, 4, 3, \ldots \)  
   c) \( 11, 36, 91, 2, \ldots \)  
   d) \( \ln 2, \ln 4, \ln 16, \ln 256, \ldots \)

5. Evaluate.
   a) \( \sum_{i=0}^{4} 5i^2 \)  
   b) \( \sum_{n=1}^{4} \frac{1}{n(n+1)} \)  
   c) \( \sum_{n=1}^{4} (-1)^n \frac{n}{n+1} \)  
   d) \( \sum_{n=0}^{9} 7\left(\frac{1}{2}\right)^n \)

6. Rewrite the following sums using sigma notation (\( \sum \)).
   a) \( 1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \ldots \)  
   b) \( 3 - \frac{2}{4} + \frac{3}{16} - \frac{4}{64} + \frac{5}{256} \)

7. An elastic object is dropped from a height of 21 centimeters. It rebounds \( \frac{2}{3} \) of the distance from which it fell previously and continues to rebound in this manner.
   a) Find the height of the object after the 3\textsuperscript{rd} bounce?
   b) If this process continues until it comes to rest, determine the total distance this object will have traveled.

8. If the membership of an organization that now has 320 members increases by 50% each year (and assuming no one drops out), determine its membership five years from now.
9. Consider the expansion of \((2x - 3y)^{12}\).
   a) Give the number of terms in its expansion.
   b) Determine the coefficient of the 10th term.
   c) Using the Binomial Theorem, expand and simplify the first four terms.

10. If \(f(x) = x^5 - 3x\), use the Binomial Theorem to find \(\frac{f(x + h) - f(x)}{h}\).

11. Using sum formulas and properties of sequences, evaluate \(\sum_{k=1}^{n} (4k^2 + 5k - 8)\).

12. Using sum formulas and properties of sequences, evaluate \(\sum_{k=1}^{28} (4k^2 + 5k - 8)\).

13. Express in simplest factored form.
   a) \(4x(x - 5)^{-\frac{3}{2}} + 2(x - 5)^{\frac{3}{2}}\)
   b) \(\frac{(7 + x^2)^{\frac{7}{2}} \cdot 3x - x^2 \cdot \frac{1}{2} (7 + x^2)^{\frac{5}{2}} \cdot 2x}{7 + x^2}\)

(Answers)

1. \((2, -3, 1)\)  
2. max of 189 at \((27, 0)\) 
   maximize: \(P = 500x + 800y\)  
   subject to: \(x \geq 0, \ y \geq 0\) \(x + y \leq 250\) \(2300x + 2600y \leq 700,000\)

3. \(x = \# \) of units of Model A computers
   \(y = \# \) of units of Model B computers

4. a) geometric; ratio is \(-\frac{1}{3}\)  
   b) not geometric  
   c) not geometric  
   d) geometric; ratio is 2

5. a) 150  
   b) 3  
   c) \(\frac{11}{60}\)  
   d) \(\frac{4}{3}\)

6. a) \(\sum_{n=1}^{\infty} \frac{1}{n^2}\)  
   b) \(\sum_{n=0}^{4} (-1)^n \cdot 3 \left(\frac{1}{2}\right)^n\)

7. a) \(\frac{56}{\frac{5}{2}}\) cm  
   b) 105 cm

8. 2430

9. a) 13 terms  
   b) \(\frac{12}{9}(2x)^3(-3y)^9 = -34,642,080x^3y^9\)  
   c) \((2x)^2 + \binom{12}{1}(2x)^1(-3y)^1 + \binom{12}{2}(2x)^0(-3y)^2 + \binom{12}{3}(2x)^0(-3y)^3 + ...\)
   \(= 4096x^{12} - 73,728x^{11}y + 608,256x^{10}y^2 - 304,128x^9y^3 + ...\)

10. \(5x^4 + 10x^3h + 10x^2h^2 + 5xh^3 + h^4 - 3\)

11. \(\frac{4}{6} \left[ \frac{n(n+1)(2n+1)}{6} \right] + 5 \left[ \frac{n(n+1)}{2} \right] - 8n = \frac{2n(n+1)(2n+1)}{3} + \frac{5n(n+1)}{2} - 8n\)

12. 32,662

13. a) \(\frac{2(3x - 5)}{(x - 5)^{\frac{3}{2}}}\)  
   b) \(\frac{x(21 + 2x^2)}{(7 + x^2)^{\frac{7}{2}}}\)