List your steps to support your solutions and use proper notation. Express your solutions to the word problems in complete sentences.

1. Graph the system of inequalities in two variables.
   \[
   \begin{align*}
   y &> 5x - 4 \\
   y &\leq x + 4
   \end{align*}
   \]
   
   y = 5x - 4
   test (0, 0)
   0 > -4  yes
   
   y = x + 4
   test (0, 0)
   0 \leq 4  yes

2. Graph the system of inequalities in two variables.
   \[
   \begin{align*}
   5x - 2y &\leq -2 \\
   x + 2y &> 10
   \end{align*}
   \]
   
   5 \cdot 2 - 2 \cdot 2 = -2
   -2 \cdot 2 = -5 - 2
   y = \frac{5}{2}x + 1
   test (0, 0)
   0 \leq -2  no
   
   x + 2y = 10
   2 \cdot 2 = -x + 10
   y = -\frac{1}{2}x + 5
   test (0, 0)
   0 > 10  no

3. Simplify
   a. \((2x^3)(-5x^4)\)
   \[= -10x^7\]
   b. \(\frac{42m^6}{7m^4}\)
   \[= 6m^2\]
   c. \(-9^0\)
   \[= -1\]
   d. \((-2)^0\)
   \[= 1\]
   
   e. \([x^7]^6\]
   \[= [x^{42}]^2\]
   \[= x^{84}\]
   f. \(\frac{14x^{21}y^{10}z^4}{7x^{10}y^{10}z^3}\)
   \[= 2x^4y^2z\]
   g. \(\left(\frac{x^8y^4}{y^3}\right)^2\)
   \[= \left(\frac{x^8y^4}{y^3}\right)^2\]
   \[= \frac{x^{16}y^8}{y^6}\]

4. Classify the polynomial as a monomial, binomial, trinomial, or none of these.
   a. \(\frac{4}{5}x^3 + \frac{2}{5}x^2 - x\)
   trinomial
   b. \(6x^2 - 5\)
   binomial
   c. \(-6x^2\)
   monomial
5. Write the polynomial in standard form. Then determine the leading coefficient and its degree.

<table>
<thead>
<tr>
<th>Polynomial</th>
<th>Standard form</th>
<th>Leading coefficient</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-7x - 12x^3 + 9$</td>
<td>$-12x^3 - 7x + 9$</td>
<td>$-12$</td>
<td>$3^{rd}$</td>
</tr>
<tr>
<td>$6 + 4x$</td>
<td>$4x + 6$</td>
<td>$4$</td>
<td>$1^{st}$</td>
</tr>
</tbody>
</table>

6. Find the opposite of the given polynomial.
   a. $y^3 - 9y^2 - 21$

   $-y^3 + 9y^2 + 21$

   b. $-2n^3 + 3n - 5$

7. Evaluate $x^2 + \frac{2}{5}x - 4$ for $x = \frac{3}{2}$.

   \[ \left(\frac{3}{2}\right)^2 + \frac{2}{5} \left(\frac{3}{2}\right) - 4 = \frac{9}{4} + \frac{3}{5} - 4 \]

   \[ = \frac{45}{20} + \frac{12}{20} - \frac{80}{20} = \frac{-23}{20} \]

8. Solve problems 8 – 11 using a system of equations. To receive full credit you must: Identify the unknowns, list your steps to support your solutions and express your solutions in complete sentences.

8. Sarah blends coffee for Tasti-Delight. She needs to prepare 130 pounds of blended coffee beans selling for $3.90 per pound. She plans to do this by blending together a high-quality bean costing $4.75 per pound and a cheaper bean at $2.00 per pound. To the nearest pound, find how much high-quality bean and how much cheaper coffee bean she should blend.

   \[ \begin{align*}
   \text{High-quality bean} & \quad \text{Cheaper bean} \\
   \text{Price per lb.} & \quad 4.75 \quad 2.00 \\
   \text{# of lbs.} & \quad x \quad y \\
   \text{Total lbs.} & \quad x + y = 130 \\
   \text{Total cost} & \quad 4.75x + 2y = 507 \\
   \text{Solving the system of equations:} & \quad \begin{cases} 
   x + y = 130 \\
   4.75x + 2y = 507
   \end{cases}
   \end{align*} \]

   \[ \begin{align*}
   \text{Subtracting the first equation from the second:} & \quad 2.75x = 257 \\
   \text{Solving for } x & \quad x = 91.81 \\
   \text{Solving for } y & \quad y = 40
   \end{align*} \]

   90 lbs of the higher quality bean and 40 lbs of the cheaper bean is needed.
9. Pure acid is to be added to a 10% acid solution to obtain 90 liters of 65% solution. What amount of each should be used?

\[
\begin{align*}
10\% \text{ acid} & \quad 100\% \\
\text{+ liters} & \quad + y \\
x \quad & \quad y \\
\hline
x + y & = 90 \\
\end{align*}
\]

\[
\begin{align*}
x + 0.1y & = 0.65(90) \\
x + 0.1y & = 58.50 \\
-0.9y & = 31.50 \\
y & = 35
\end{align*}
\]

55 liters of pure acid must be mixed with 35 liters of 10% acid.

10. Jim began a 109-mile bicycle trip to build up stamina for a triathlete competition. Unfortunately, his bicycle chain broke, so he finished the trip walking. The whole trip took 3 hours. If Jim walks at a rate of 3 miles per hour and rides at 43 miles per hour, find the amount of time he spent on the bicycle.

\[
\begin{align*}
x + y & = 3 \\
43x + 3y & = 109
\end{align*}
\]

\[
\begin{align*}
-3x - 3y & = -9 \\
40x & = 100 \\
x & = 2.5 \\
y & = 0.5
\end{align*}
\]

He biked for \(\frac{3}{2}\) an hour and walked for \(\frac{1}{2}\) hours.

11. Nicholas paddles his canoe downstream from the Lodge to Big Bend in 2 hours and then back upstream to the Lodge in 7 hrs. If the distance from the Lodge to Big Bend is 14 miles, find Nicholas' speed in still water and the speed of the current.

\[
\begin{align*}
x + y & = 7 \\
7(x - y) & = 14 \\
2(x + y) & = 14
\end{align*}
\]

\[
\begin{align*}
x - y & = 2 \\
x + y & = 7 \\
2x & = 9 \\
x & = 4.5
\end{align*}
\]

The rate in still water is 4.5 mph and the rate of the current is 2.5 mph.