1. The point \((a, 2)\) is the point of intersection of the lines with equations \(y = 2x - 4\) and \(y = x + k\). Determine the value of \(k\).

2. Graph the following regions.
   a) \(y \leq -2\)  
   b) \(x > 3\)  
   c) \(y \geq 2x - 5\)  
   d) \(2x + y < 4\)

3. To find \(x\)-intercepts, set \(y = 0\) and solve for \(x\). To find \(y\)-intercepts, set \(x = 0\) and solve for \(y\). Graph the following regions by finding intercepts.
   a) \(3x - 4y > 12\)
   b) \(5x + 3y \leq 5\)

4. Graph the feasible region given the following inequalities:
   
   \[
   \begin{align*}
   x + y &\leq 9 \\
   x + 2y &\leq 15 \\
   2x + y &\leq 15 \\
   x &\geq 0 \\
   y &\geq 0
   \end{align*}
   \]

5. Graph the feasible region given the following inequalities:
   
   \[
   \begin{align*}
   x + 2y &\geq 6 \\
   2x + y &\geq 5 \\
   2x + 3y &\geq 10 \\
   x &\geq 0 \\
   y &\geq 0
   \end{align*}
   \]

6. The correct formula for converting Celsius temperature \(C\) to a Fahrenheit temperature \(F\) is given by \(F = \frac{9}{5}C + 32\).

   Andrew does not like arithmetic. So he approximates the Fahrenheit temperature by doubling \(C\) and then by adding 30 to get \(f\).

   If \(f < F\), then the error in the approximation is \(F - f\); otherwise, the error in the approximation is \(f - F\). Determine the largest possible error in the approximation that Andrew would make when converting Celsius temperatures \(C\) with \(20 \leq C \leq 35\).
7. Gloria is trying to devise a strategy to earn the highest return on her investments. She estimates that investing in real estate yields a 13% annual return on the investment, and the stock market a 17% return. Eeshan does some calculations and advises Gloria to invest at least as much in real estate as in stocks. If she has $20,000 to invest, how should she invest it? Set up the inequalities that satisfy the given conditions.

8. Suppose that $x$ and $y$ are positive numbers with

\[
xy = \frac{1}{9} \\
x(y + 1) = \frac{7}{9} \\
y(x + 1) = \frac{5}{18}
\]

What is the value of $(x + 1)(y + 1)$?

9. The line $y = -\frac{3}{4}x + 9$ crosses the $x$-axis at $P$ and the $y$-axis at $Q$. Point $T(r, s)$ is on line segment $PQ$. If the area of $\triangle POQ$ is three times the area of $\triangle TOP$, then what is the value of $r + s$?

10. A triangle has vertices $A(0, 3)$, $B(4, 0)$, $C(k, 5)$, where $0 < k < 4$. If the area of the triangle $\triangle ABC$ is 8, determine the value of $k$. 