Solve each equation. Show all algebraic work for full credit. (3 points each)

1) \[14 - x = 22\]
   \[\begin{align*}
   -14 & -14 \\
   \hline
   \hline
   \hline
   \hline
   \end{align*}\]
   \[x = 8\]
   \[x = -8\]

2) \[\frac{2}{5}x + 6 = 30\]
   \[\begin{align*}
   -6 & -6 \\
   \hline
   \hline
   \hline
   \hline
   \end{align*}\]
   \[\frac{2}{5}x = 24 \\
   \frac{5}{2} \cdot \frac{2}{5}x = 24 \cdot \frac{5}{2} \\
   \rightarrow \text{Isolate the variable term.} \\
   \hline
   \hline
   \hline
   \hline
   \end{align*}\]
   \[x = 60\]

3) \[7x + 3 = -5x + 15\]
   \[\begin{align*}
   +5x & +5x \\
   \hline
   \hline
   \hline
   \hline
   \end{align*}\]
   \[12x + 8 = 15 \\
   -3 & -3 \\
   \hline
   \hline
   \hline
   \hline
   \end{align*}\]
   \[12x = 12 \\
   \frac{12}{12}x = \frac{12}{12} \\
   \rightarrow \text{Multiply by the reciprocal.} \\
   \hline
   \hline
   \hline
   \hline
   \end{align*}\]
   \[x = 1\]
Solve each equation. Show all algebraic work for full credit. (3 points each)

4) \[2(6y - 11) = 38\]

\[
\begin{align*}
12y - 22 &= 38 \\
\quad + 22 &= +22 \\
12y &= 60 \\
\frac{12y}{12} &= \frac{60}{12} \\
\quad y &= 5
\end{align*}
\]

5) \[\left(\frac{1}{2}x + \frac{1}{3} = \frac{2}{3}x\right)\]

\[
\begin{align*}
\frac{6}{1} \cdot \frac{1}{2}x + \frac{6}{1} \cdot \frac{1}{3} &= \frac{6}{1} \cdot \frac{2}{3}x \\
3x + 2 &= 4x \\
\quad -3x &= -3x \\
\quad 2 &= x
\end{align*}
\]

6) \[5x - (8x - 4) = -17 - 10x\]

\[
\begin{align*}
5x - 8x + 4 &= -17 - 10x \\
\quad -3x + 4 &= -17 - 10x \\
\quad +10x &= +10x \\
7x + 4 &= -17 \\
\quad -4 &= -4 \\
7x &= -21 \\
\frac{7x}{7} &= \frac{-21}{7} \\
\quad x &= -3
\end{align*}
\]
Solve the equation. Show all algebraic work for full credit. (3 points)

7) \(5(y - 7) - 12 = 2(y + 8)\)

\[
\begin{align*}
5y - 35 - 12 &= 2y + 16 \\
5y - 47 &= 2y + 16 \\
-2y &= -2y \\
3y - 47 &= 16 \\
&= 47 \\
&= y = 21
\end{align*}
\]

\[\frac{3y}{3} = \frac{63}{3}\]

\[y = 21\]

Solve each inequality and graph the solution on the number line provided. (3 points each)

8) \(-5x + 22 + 3x > 12\)

\[
\begin{align*}
-2x + 22 &> 12 \\
-2x &> -10 \\
x &< 5
\end{align*}
\]

\[x < 5\]

9) \((0.14x + 1.85 ≤ 0.36x + 2.25 - 0.32x)\)

\[
\begin{align*}
14x + 185 &≤ 36x + 225 - 32x \\
14x + 185 &≤ 4x + 225 \\
-4x &≤ -4x \\
10x + 185 &≤ 225 \\
&= 185 \\
&= \frac{10x}{10} ≤ \frac{40}{10} \\
&= x ≤ 4
\end{align*}
\]

\[x ≤ 4\]
10) Write the equation of a line that has a slope of 3 and intersects the y-axis at (0, -9). (2 points)

\[ y = 3x - 9 \]

11) Write the equation of the line for the graph shown. (2 points)

\[ m = \frac{-3600}{4} = -900 \]
\[ b = y\text{-intercept} = 9000 \]
\[ y = mx + b \]
\[ y = -900x + 9000 \]

12) Find the slope of each line. Then state whether the two lines are parallel, perpendicular or neither. Show your work and justify your answer for full credit. (3 points)

\[ y = -3x - 5 \]
\[ \text{Slope of first line} \quad -3 \]
\[ y = \frac{3x + 1}{7} \]
\[ \text{Slope of second line} \quad \frac{1}{3} \]

Answer with reason: The lines are perpendicular because the slopes are opposite reciprocals.
13) Given the line \( 3x + 4y = 24 \), find the following. (1 point each)

\[
\begin{align*}
\frac{x}{8} + \frac{y}{6} &= \frac{4y}{4} - \frac{3x}{4} + \frac{24}{4} \\
\Rightarrow y &= -\frac{3}{4}x + 6
\end{align*}
\]

a) x-intercept: \((8, 0)\)
b) y-intercept: \((0, 6)\)
c) slope: \(-\frac{3}{4}\)
d) Graph.

14) Use the graph to find the rate of cable installation over time. Include units in your answer. (1 point)

\[
M = \frac{5400 - 900}{10 - 1} = \frac{4500}{9} = 500
\]

14) 900 feet per hour
15) The value $v$ of a copy machine, in thousands of dollars, is given by:

$$v = -\frac{1}{2} t + 3$$

where $t$ is the time from the date of purchase (in years).

a) Graph the equation. (2 points)

b) Use the graph to estimate the value of the copier after 3 years. (1 point) $\underline{500}$

(c) Find the rate, in dollars per year, that the value of the copier was decreasing. (1 point) $\underline{500 \text{ per year}}$
16) Write the equation of the line that contains the points \((-2, 11)\) and \((5, -3)\). (3 points)

\[
M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 11}{5 - (-2)} = \frac{-14}{7} = -2
\]

\[
y = mx + b
\]
\[
-3 = -2(5) + b
\]
\[
-3 = -10 + b
\]
\[
+10 +10
\]
\[
7 = b
\]

17) If \(f(x) = x^2 + 11\), then find \(f(0)\) and \(f(-3)\). (1 point each)

a) \(f(0) = (0)^2 + 11 = 11\)  \(\text{Plug these #'s in for } x.\)  \(17a) 11\)

b) \(f(-3) = (-3)^2 + 11\)
\[
9 + 11 = 20\)  \(17b) 20\)
18) What is the domain and range of the following function? Write your answer in interval notation. (1 point each)

Domain: \((-6, 6] \)

Range: \((-5, 4]\) 

19) Find the point of intersection of the two lines using the substitution method. (3 points)

\[
\frac{x + 2y}{2} = 16 \\
y = \frac{3x + 1}{3x + 1}
\]

Substitute

\[x + 2(3x + 1) = 16\]
\[x + 6x + 2 = 16\]
\[7x + 2 = 16\]
\[-2 -2\]
\[7x = 14\]
\[\frac{7x}{7} = \frac{14}{7}\]
\[x = 2\]

\[y = 3(2) + 1\]
\[y = 6 + 1\]
\[y = 7\]

\((2, 7)\)
20) Find the point of intersection of the two lines using the elimination (addition) method. (3 points)

\[
\begin{align*}
-4 (x - 2y &= 2) \quad -4 \\
4x + y &= 17 \\
\Rightarrow -4x + 8y &= -8 \\
\quad + 4x + y &= 17 \\
\hline \\
9y &= 9 \\
\quad y &= 1 \\
\hline \\
\quad x - 2 (1) &= 2 \\
\quad x - 2 &= 2 \\
\quad + 2 &+ 2 \\
\hline \\
\quad x &= 4 \\
\end{align*}
\]

21) Express 340,000,000 in scientific notation. (1 point)

21) \[3.4 \times 10^8\]

22) Write \(3.6 \times 10^{-4}\) in standard form (decimal notation). (1 point)

22) \[0.00036\]

23) Multiply. Write your answer in scientific notation. (2 points)

\[(2.7 \times 10^{12})(3 \times 10^{-8})\]
Simplify each expression. Write the result using positive exponents. Please circle your final answer. (2 point each)

24) \(x^{-10} \cdot x^5 \cdot x\)
\[\frac{1}{x^4}\]

25) \((2^5)^4\)
\[2^{20}\]

26) \((-4a^{-4}b^5)^2\)
\[16a^8b^{10}\]

27) \(\frac{12x^7y^6}{20x^2y^{-2}}\)
\[\frac{3x^5y^8}{5}\]

Perform the indicated operations. Simplify answers fully. (2 points each)

28) \(15x^3 + 12x^2 - 4 + 3x^2 - 5x^3 - 1\)
\[10x^3 + 15x^2 - 5\]

29) \((6x^2 + x - 10) - (4x^2 - 3x + 8)\)
\[2x^2 + 4x - 18\]

30) \(6x(x^2 + 3x - 5)\)
Perform the indicated operations. Simplify answers fully. (2 points each)

31) \((2x - 5)^2\)
\[
(2x - 5)(2x - 5)
\]
\[
4x^2 - 10x - 10x + 25
\]
\[
\text{underlined: } 4x^2 - 20x + 25
\]

32) \((3p + 8)(3p - 8)\)
\[
9p^2 - 64
\]

33) \((4x - 6y)(x - 2y)\)
\[
4x^2 - 8xy - 6xy + 12y^2
\]
\[
\text{underlined: } 4x^2 - 14xy + 12y^2
\]

34) \[
\frac{15x^3 + 55x^2 - 30x}{-5x}
\] = \[
\frac{15x^3}{-5x} + \frac{55x^2}{-5x} - \frac{30x}{-5x}
\]
\[
-3x^2 - 11x + 6
\]
35) A walkway rises 3 feet vertically over a horizontal distance of 51.6 feet. What is the grade of the walkway as a percent? Round to the nearest tenth of a percent. (2 points)

\[
\text{grade} = \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{3}{51.6} = 0.0581\ldots
\]

\[5.8\%\]

36) A rental car company charges a $50 flat fee plus $20 for each day a car is rented. Write the equation of the line that models this relationship. (2 points)

\[y = 20x + 50\]

37) When all \(n\) teams in a baseball league play every other team twice, a total of \(G\) games are played, where \(G = n^2 - n\). If a baseball league has 11 teams and all teams play each other twice, how many games are played? (2 points)

\[G = (11)^2 - 11\]

\[= 121 - 11\]

\[= 110 \text{ games}\]
38) You paid $35.40 for a meal including a 18% tip. How much was the cost before the tip? Round your answer to two decimal places. (3 points)

\[ X = \text{Cost of meal before tip} \]

\[ X + 0.18X = 35.40 \]

\[ 1.18X = 35.40 \]

\[ \frac{1.18X}{1.18} = \frac{35.40}{1.18} \]

\[ X = 30 \]

39) The equation \( C = 2d + 2.5 \) can be used to determine the cost of a taxi ride \( C \), in dollars, given the number of miles, \( d \), that the taxi travels. Determine the distance a taxi drove for a ride that costs $15.50. (3 points)

\[ 15.50 = 2d + 2.5 \]

\[ -2.5 \]

\[ \frac{13}{2} = \frac{2d}{2} \]

\[ 7.5 = d \]

40) Karen’s financial aid stipulates that her tuition not exceed $7,000. If her local community college charges a $125 registration fee plus $1,600 per course, what is the greatest number of courses for which Karen can register? (3 points)

\[ X = \text{number of courses} \]

\[ 125 + 1600X \leq 7000 \]

\[ -125 \]

\[ 1600X \leq 6875 \]

\[ \frac{1600X}{1600} \leq \frac{6875}{1600} \]

\[ X \leq 4.29 \]

Karen can register for at most 4 classes.
41) A trip to New York City costs $50 for children and $80 for adults. A total of 42 people went on the trip and $3,000 was collected altogether. How many student tickets were sold? How many adult tickets were sold? (3 points)

\[ \begin{align*}
\text{c} &= \text{number of children (}$50\text{)} \\
\text{a} &= \text{number of adults (}$80\text{)} \\
\end{align*} \]

\[-50\left(\text{a} + \text{c} = 42\right) - 50 \]
\[80\text{a} + 50\text{c} = 3000 \]

\[ \begin{align*}
-50\text{a} - 50\text{c} &= -2100 \\
+ 80\text{a} + 50\text{c} &= 3000 \\
\hline
30\text{a} &= 900 \\
\hline
\frac{30\text{a}}{30} &= \frac{900}{30} \\
\text{a} &= 30 \\
30 + \text{c} &= 42 \\
\text{c} &= 12
\end{align*} \]

12 children
30 adults

**BONUS: (3 points)**

Erin’s age, when divided by 2, 3, 4, or 5, gives a remainder of 1. Find the least age that Erin could be given that she is older than 1.

Bonus: 61 years old