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

1) \[ \frac{30}{22} = \frac{22 - x}{-22} \]

\[ 8 = -x \]

\[ -8 = x \]

\[ x = -8 \]

2) \[ \frac{3}{4}x - 6 = 12 \]

\[ +6 \]

\[ +6 \]

\[ \frac{3}{4}x = 18 \]

\[ \cdot \frac{4}{3} \]

\[ x = 24 \]

\[ x = 24 \]

3) \[ 2y + 5 = -6y + 29 \]

\[ +6y \]

\[ +6y \]

\[ 8y + 5 = 29 \]

\[ -5 \]

\[ -5 \]

\[ 8y = 24 \]

\[ \div \ 8 \]

\[ y = 3 \]

\[ y = 3 \]
Solve each equation. Show all algebraic work for full credit. (3 points each)

4) \(5(4y - 2) = 70\) 
   Distribute
   
   \[
   20y - 10 = 70 \\
   +10 +10
   \]
   
   \[
   20y = 80 \\
   \frac{20y}{20}
   \]
   
   \(y = 4\)

5) \(\frac{1}{4}x + \frac{1}{3} = \frac{3}{4}x\) 
   \(\text{LCM} = 12\)
   
   \[
   \frac{12}{1} \cdot \frac{1}{4}x + \frac{12}{1} \cdot \frac{1}{3} = \frac{12}{1} \cdot \frac{3}{4}x
   \]
   
   \[
   \frac{3}{x} + 4 = \frac{9}{x}
   \]
   
   \[
   -3 \cdot \frac{3}{x} = -3 \cdot \frac{3}{x}
   \]
   
   \[
   \frac{4}{6} = \frac{6}{6}
   \]
   
   \[
   \frac{2}{3} = x
   \]

6) \(12x - (2x - 6) = -20 - 3x\) 
   \(\text{Distribute}\)
   
   \[
   12x - 2x + 6 = -20 - 3x
   \]
   
   \[
   10x + 6 = -20 - 3x
   \]
   
   \[
   +3x +3x
   \]
   
   \[
   13x + 6 = -20
   \]
   
   \[
   -6 -6
   \]
   
   \[
   13x = -26
   \]
   
   \[
   \frac{13}{13} \cdot \frac{-26}{13}
   \]
   
   \(x = -2\)
Solve the equation. Show all algebraic work for full credit. (3 points)

7) \[4(y + 1) = 5(y - 5) - 2y \rightarrow \text{distribute} \]

\[4y + 4 = 5y - 25 - 2y\]
\[-3y\]
\[y + 4 = -25\]
\[y = -29\]

7) \[y = -29\]

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

8) \[7x \leq 3x + 16\]
\[-3x\]
\[4x \leq 16\]
\[x \leq 4\]

8) \[x \leq 4\]

*Remember to reverse the direction of the inequality when you multiply or divide by a negative number.*

9) \[(1.25 + 3.75x + 7.5x > -1.5x + 26.75)\]

\[125 + 375x + 750x > -150x + 2675\]
\[125 + 1125x > -150x + 2675\]
\[+150x\]
\[+150x\]
\[125x > 2550\]
\[x > 2\]

9) \[x > 2\]

Clear Decimals
10) Write the equation of a line that has a slope of $-\frac{1}{2}$ and intersects the y-axis at (0, 11). (2 points)

$$y = mx + b$$

$$y = -\frac{1}{2}x + 11$$

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

![Graph showing a line with y-intercept at (0, 9000) and passing through the point (11, 0).]

$$y = mx + b$$

$$y = -900x + 9000$$

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)

$$y = \left(\frac{3}{4}\right)x + 1$$

Slope of first line $\frac{-1}{4}$

$$-4x + y = 8$$

$$+4x + 4x$$

$$y = \left(\frac{1}{4}\right)x + 8$$

Slope of second line $\frac{4}{1}$

Answer with reason: The lines are perpendicular because the slopes are opposite reciprocals.
13) Given the line \( 5x + 3y = 15 \), find the following. (1 point each)

\[
\begin{array}{c|c}
X & Y \\
0 & 5 \\
3 & 0 \\
\end{array}
\]

\[
\begin{align*}
\text{Slope:} & \quad \frac{-5x}{3} \\
\text{y-intercept:} & \quad \left(0, \frac{15}{3}\right) \\
\text{x-intercept:} & \quad \left(3, 0\right) \\
\end{align*}
\]

Graph.

14) Use the graph to find the rate at which the population was changing over time. Include the proper units in your answer. (1 point)

\[
\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
\frac{-40}{20} = \$2,000 \text{ thousand per year}
\]

14) \( \frac{-2,000}{\text{per year}} \)
15) The cost to enter a state park is $6.00 per car plus $2.00 for each person in the car.

a) What would the cost be if there is 1 person in the car? $8.00 (2 points) $6.00 + $2(1)

b) What would the cost be if there are 4 people in the car? $14.00 (2 points) $6.00 + $2(4)

c) Write an equation that models this situation.
Let $y = \text{the cost}$ and let $x = \text{the number of people in the car}.$

Equation: $y = 6 + 2x$ (2 points)

Of $y = 2x + 6$
16) Write the equation of the line that contains the points (-10, 8) and (5, 11). (3 points)

\[ \text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{11 - 8}{5 - (-10)} = \frac{3}{15} = \frac{1}{5} = m \]

\[ y = mx + b \]

\[ 11 = \frac{1}{5}(5) + b \]

\[ 11 = 1 + b \]

\[ 10 = b \]

\[ y = \frac{1}{5}x + 10 \]

17) If \( f(x) = x^2 + 9x + 18 \), then find \( f(0) \) and \( f(-2) \). (1 point each)

a) \( f(0) = (0)^2 + 9(0) + 18 \)

\[ 17a) \ 18 \]

b) \( f(-2) = (-2)^2 + 9(-2) + 18 \)

\[ 4 - 18 + 18 \]

\[ 4 \]
18) Find the point of intersection of the two lines using the substitution method. (3 points)

\[ 3x + 2y = 8 \]
\[ x = (y + 11) \]

Substitute:

\[ 3(y + 11) + 2y = 8 \]
[3y + 33 + 2y = 8]
[5y + 33 = 8]
[5y = -25]
[y = -5]

\[ x = y + 11 \]
\[ x = (-5) + 11 \]
\[ x = 6 \]

\[ (x, y) = (6, -5) \]

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

\[ 5x - 2y = 10 \]
\[ -5x + 3y = 19 \]

\[ -5x - 15y = -95 \]
\[ -3x - 2y = 10 \]

\[ -17y = -85 \]
\[ y = 5 \]

\[ x + 3(5) = 19 \]
\[ x + 15 = 19 \]
\[ x = 4 \]

\[ (x, y) = (4, 5) \]
20) Express 0.000042 in scientific notation. (1 point)

21) $4.2 \times 10^{-5}$

21) Write $5.25 \times 10^7$ in standard form (decimal notation). (1 point)

22) $5,250,000$.

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

$(4 \times 10^{-8})(2.3 \times 10^{12})$

23) $9.2 \times 10^4$

Simplify each expression. Write the result using positive exponents. Please circle your final answer. (2 points each)

23) $x \cdot x^{14} \cdot x^{-3}$

25) $(y^8)^3$

26) $(2x^5y^{-2})^4$

27) $\frac{9a^{10}b^5}{15a^3b^9}$
Perform the indicated operations. Simplify answers fully. (2 points each)

28) \(12x^3 - 6x^2 - 1 + 3x^3 + x + 7\)
   \[15x^3 - 5x + 6\]

Distribute the negative first.

29) \((11x^2 - 4x + 2) - (3x^2 + 2x - 8)\)
   \[11x^2 - 4x + 2 - 3x^2 - 2x + 8\]
   \[8x^2 - 6x + 10\]

30) \(7x(2x^2 + 6x - 1)\)
   \[14x^3 + 42x^2 - 7x\]

31) \((2x + 9)^2\)
   \[(2x + 9)(2x + 9)\]
   \[4x^2 + 18x + 18x + 81\]
   \[4x^2 + 36x + 81\]
Perform the indicated operations. Simplify answers fully. (2 points each)

32) \((4p + 5)(4p - 5)\) F.O.I.L.

\[
16p^2 - 20p + 20p - 25
\]

\[
16p^2 - 25
\]

33) \((4x + 3y)(x + 2y)\) F.O.I.L.

\[
4x^2 + 8xy + 3xy + 6y^2
\]

\[
4x^2 + 11xy + 6y^2
\]

34) \[
\frac{27x^4 - 9x^3 + 15x^2}{-3x^2}
\]

\[
\frac{27x^4}{-3x^2} + \frac{-9x^3}{-3x^2} + \frac{15x^2}{-3x^2}
\]

\[
-9x^2 + 3x - 5
\]
Applications. Show your algebraic work for each problem. Include the proper units. Circle your final answer.

35) A walkway rises 6 feet vertically over a horizontal distance of 74 feet. What is the grade of the walkway as a percent? Round to the nearest tenth of a percent. (2 points)

\[ \text{grade} = \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{6}{74} = 0.08108 \text{ percent} \]

\[ \approx 8.1 \% \] (rounded)

36) Young's Rule of Medicine states that for a child who is \( a \) years old, the dosage \( c \) of medicine they should receive when the adult dosage is \( d \) is given by:

\[ c = \frac{ad}{a+12} \]

If an adult dosage of an antibiotic is 150 milligrams, then what dosage of medicine should a 6-year-old child get? (2 points)

\[ c = \frac{(6)(150)}{6+12} = \frac{900}{18} = 50 \text{ mg} \]
*Choose 4 out of the following 5 word problems to complete. Please put a large X through the problem that you do not want graded. Show all work for each problem. (3 points each)

37) You paid $16.26 for a meal including a 20% tip. How much was the cost before the tip? Round your answer to two decimal places.

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

\[
\begin{align*}
X + 0.2X &= 16.26 \\
1.2X &= 16.26 \\
X &= \frac{16.26}{1.2} \\
X &= 13.55
\end{align*}
\]

38) The equation \( C = 2d + 4.5 \) 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 $54.50.

\[
\begin{align*}
\$54.50 &= 2d + 4.5 \\
-4.5 &= 2d \\
\frac{50}{2} &= d \\
25 &= d
\end{align*}
\]

39) Henry’s financial aid stipulates that his tuition not exceed $2,500. If his local community college charges a $160 registration fee plus $1,100 per course, what is the greatest number of courses for which Henry can register? Show your work.

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

\[
\begin{align*}
160 + 1100x &\leq 2500 \\
-160 &= -160 \\
1100x &\leq 2340 \\
\frac{1100x}{1100} &= \frac{2340}{1100} \\
x &\leq 2.127
\end{align*}
\]

The greatest number of courses he can register for is 2.
40) The perimeter of a field is 136 feet. The length is 12 feet longer than the width. Find the dimensions of the field.

\[ p = 136 \]
\[ x + x + 12 + x + x + 12 = 136 \]
\[ 4x + 24 = 136 \]
\[ 4x = 112 \]
\[ x = 28 \text{ feet} \]

The field is 28 feet by 40 feet.

41) A trip to New York City costs $40 for children and $60 for adults. A total of 55 people went on the trip and $2,840 was collected altogether. How many child tickets were sold? How many adult tickets were sold?

\[ x = \text{number of adult tickets sold} \quad \$60 \]
\[ y = \text{number of child tickets sold} \quad \$40 \]
\[ \frac{55 \text{ people total}}{\$2,840 \text{ collected}} \]

\[ -60(x + y = 55) - 60 \]
\[ 60x + 40y = 2840 \]
\[ -60x - 60y = -3300 \]
\[ 60x + 40y = 2840 \]
\[ -20y = -460 \]
\[ y = 23 \text{ children} \]
\[ x + 23 = 55 \]
\[ x = 32 \text{ adults} \]

BONUS: (2 points)
Find two integers that have a sum of 13 and a product of -30

Bonus: \[ 15 \text{ and } -2 \]