Solve the following equations for the unknown. (6 pts each)

1. \(-7x + 1 + 5x = -3x + 6\)
   \[-2x + 1 = -3x + 6\]
   \[+3x\]
   \[x + 1 = 6\]
   \[x = 5\]

2. \(-(z + 3) = 6z - 2(z - 4)\)
   \[-2z - 3 = 6z - 2z + 8\]
   \[+2\]
   \[-4z = 11\]
   \[z = -\frac{11}{4}\]

3. \(\frac{y}{3} = \frac{4y - 7}{10}\)
   \[10y = 3(4y - 7)\]
   \[10y = 12y - 21\]
   \[-2y = -21\]
   \[y = \frac{21}{2}\]

4. \(64 + 28x = -20(-7x + 6) - 2(-7 + 11x)\)
   \(64 + 28x = 140x - 120 + 14 - 22x\)
   \(64 + 28x = 118x - 106\)
   \[-28x\]
   \[90x = 170\]
   \[x = \frac{17}{9}\]

Solve the inequalities and graph the solution sets. Write your solutions using interval notation. (6 pts each)

5. \(4x - 3x + 2 > -4x + 12 + 7x\)
   \[x + 2 > 8x + 12\]
   \[-12\]
   \[x - 10 > 3x\]
   \[-x\]
   \[-10 > 2x\]
   \[x < -5\]

6. \(-4 < 3y + 5 \leq 23\)
   \[-5\]
   \[-5\]
   \[-9 < 3y \leq 18\]
   \[y \leq 6\]
   \[-3 \leq y \leq 6\]
7. (8 pts). Graph the line by finding the x-intercept and y-intercept (ordered pairs). Also find the slope of the line.

\[ 2x - 3y = 12 \]

x-intercept: \((6,0)\)

y-intercept: \((0,-4)\)

slope: \(\frac{2}{3}\)

\[
\begin{align*}
\text{x-intercept:} & \quad y = 0 \quad 2x = 12 \quad x = 6 \quad (6,0) \\
\text{y-intercept:} & \quad x = 0 \quad -3y = 12 \quad y = -4 \quad (0,-4) \\
M = \frac{\text{Rise}}{\text{Run}} & = \frac{4}{6} = \frac{2}{3}
\end{align*}
\]

8. (10 pts). Graph the solution of the following system of linear inequalities: (Show all steps necessary to graph each region.)

\[ y \leq 2x - 2 \quad \text{SOLID LINE} \quad M = 2, \quad y = \text{inter} (0,-2) \]

\[ y > \frac{3}{2}x + 4 \quad \text{-DASHED} \quad M = -\frac{3}{2}, \quad y = \text{inter} (0,4) \]

\[ \text{LINE 1} \quad y \leq 2x - 2 \]

\[ \begin{align*}
0 & \leq 0 - 2 \\
0 & \leq -2
\end{align*} \quad \text{FALSE} \]

\[ \text{LINE 2} \quad y > \frac{-3}{2}x + 4 \]

\[ \begin{align*}
0 & > 0 + 4 \\
0 & > 4
\end{align*} \quad \text{FALSE} \]
9. (6 pts) Find the slope of the line going through the points (-5, -6) and (-5, 6).

\[ M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-6)}{-5 - (-5)} = \frac{12}{0} = \text{undefined} \]

10. (6 pts) Find the equation of the line. Put your answer in slope-intercept form.

\[ M = \frac{\text{Rise}}{\text{Run}} = -\frac{2}{3} \]

\[ y - y_1 = m(x - x_1) \]

\[ y = mx + b \]

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

11. (6 pts) Solve the following system of linear equations. (Use either the Substitution or Elimination method).

\[ \begin{align*}
2x + y &= 3 \\
3x - y &= 7
\end{align*} \]

\[ \begin{align*}
5x &= 10 \\
\frac{5x}{5} &= \frac{10}{5} \\
x &= 2
\end{align*} \]

\[ \begin{align*}
2(2) + y &= 3 \\
y &= 3 - 4 \\
y &= -1
\end{align*} \]

\[ (2, -1) \]
12. (6 pts) Simplify completely.

\[
\frac{x(x^2)^3 x^4}{x^5} = \frac{(x)(x^6)(x^4)}{x^5} = \frac{x^{11}}{x^5} = x^6
\]

13. (6 pts) Perform the indicated operation. Combine all like terms and simplify the expression.

\[
(x+4)^2 = (x+4)(x+4) = x^2 + 4x + 4x + 16 = x^2 + 8x + 16
\]

14. (6 pts) Factor completely. If it cannot be reduced, write "PRIME".

\[
\frac{xy + 4x + 2y + 8}{x(y+4) + 2(y+4)} = \frac{(y+4)(x+2)}{(y+4)(x+2)} \text{ FACTOR BY GROUPING}
\]

15. (6 pts) Factor completely. If it cannot be reduced, write "PRIME".

\[
x^2 + 81 = \text{PRIME}
\]
16. (6 pts) Factor completely. If it cannot be reduced, write “PRIME”.

\[ 10x^2 + 11x + 3 \]

\[
\begin{align*}
(2x+1)(5x+3)
\end{align*}
\]

17. (6 pts) Solve the following quadratic equation by factoring: \( 2x^2 + 5x - 3 = 0 \)

\[
(2x-1)(x+3) = 0
\]

\[
\begin{align*}
2x-1 &= 0 \\
+1 &= +1 \\
2x &= 1 \\
\frac{2x}{2} &= \frac{1}{2} \\
x &= \frac{1}{2}
\end{align*}
\]

\[
\begin{align*}
x+3 &= 0 \\
x &= -3
\end{align*}
\]

18. (8 pts) The length of a rectangle is 5 meters more than the width. The area is 84 square meters. Find the dimensions of this rectangle (length and width). Use algebra here (no guessing). Set up an equation and solve that equation.

\[
A = LW
\]

\[
84 = x(x+5)
\]

\[
\begin{align*}
x^2 + 5x - 84 &= 0 \\
(x-7)(x+12) &= 0 \\
x &= 7, -12
\end{align*}
\]

WIDTH = 7 m
LENGTH = \( x+5 = 7+5 = 12 \) m
19. (6 pts) List all numbers for which the expression is undefined (bad points)
\[
\frac{5y-9}{y^2-25} = 0
\]
\[
(y-5)(y+5) = 0
\]
\[
y = 5, -5
\]

20. (6 pts) Perform the indicated operation. Make sure to simplify your answer to reduced form.
\[
\frac{3x-9}{x-5} \cdot \frac{x^2-3x-10}{x^2-9} = \frac{3(x+2)}{x+3}
\]

21. (6 pts) Add.
\[
\frac{t+2}{3t-9} + \frac{3-2t}{5t-15} = \frac{3(5)}{15(x-3)}
\]

22. (6 pts) Solve for x:
\[
\frac{2}{x+2} - \frac{7}{x-3} = \frac{5}{x^2-x-6}
\]
\[
\text{Multiply both sides by LCD:}
2(x-3) - 7(x+2) = 5
\]
\[
2x-6 - 7x - 14 = 5
\]
\[
-5x - 20 = 5
\]
\[
-5x = 25
\]
\[
x = -5
\]

Remember to check.
23. (8 pts) Find the missing side of the triangle. Give the exact answer (i.e. leave it in radical form).

\[ x^2 + 8^2 = 16^2 \]
\[ x^2 + 64 = 256 \]
\[ -64 \]
\[ x^2 = 192 \]
\[ x = \sqrt{192} \]
\[ x = \sqrt{164} \sqrt{3} \]
\[ = 8\sqrt{3} \text{ ft} \]

24. (6 pts) Rationalize the denominator and simplify.

\[ \frac{25\sqrt{15}}{10\sqrt{2}} \]
\[ \frac{5\sqrt{30}}{20} \]
\[ = \frac{\sqrt{30}}{4} \]

25. (6 pts) Add and simplify.

\[ 2\sqrt{27} + 3\sqrt{75} \]
\[ 6\sqrt{3} + 15\sqrt{3} \]
\[ = 21\sqrt{3} \]

26. (8 pts) Solve the radical equation: \[ \sqrt{3x + 4} = 10 \]

\[ (\sqrt{3x+4})^2 = (10)^2 \]
\[ 3x + 4 = 100 \]
\[ -4 \]
\[ 3x = 96 \]
\[ \frac{3}{3} \]
\[ x = 32 \]
Solve the equation using the square root property. Write all radicals in simplest form.

27. (6 pts) \((2m + 3)^2 = 15\)

\[
\sqrt{(2m+3)^2} = \pm \sqrt{15}
\]

\[
2m + 3 = \pm \sqrt{15}
\]

\[
\frac{-3}{-3} = \frac{-3}{-3} \pm \frac{\sqrt{15}}{-3}
\]

\[
2m = -3 \pm \frac{\sqrt{15}}{2}
\]

\[
m = \frac{-3 \pm \frac{\sqrt{15}}{2}}{2}
\]

28. (6 pts) Solve using the quadratic equation. \(3x^2 = -8x + 4\)

\[
3x^2 + 8x - 4 = 0
\]

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

\[
= \frac{-8 \pm \sqrt{8^2 - 4(3)(-4)}}{2(3)}
\]

\[
= \frac{-8 \pm \sqrt{64 + 48}}{6}
\]

\[
= \frac{-8 \pm \sqrt{112}}{6}
\]

\[
= \frac{-8 \pm 4\sqrt{7}}{6}
\]

\[
x = \frac{2(-4 \pm 2\sqrt{7})}{3}
\]

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