

Solve the equations.

1. (3pts) $4x - 9 = 2x - 3 + 5(x - 1)$

$$4x - 9 = 2x - 3 + 5x - 5$$

$$4x - 9 = 7x - 8 \quad | -4x + 8$$

$$-1 = 3x$$

$$x = -\frac{1}{3}$$

2. (6pts) $x^2 - x + 4 = 3x + 25 \quad | -3x - 25$

$$x^2 - 4x - 21 = 0$$

$$(x - 7)(x + 3) = 0$$

$$x = 7, -3$$

3. (5pts) Solve the equation for y :

$$L = ax - by^2 \quad | -ax$$

$$L - ax = -by^2 \quad | \div (-b)$$

$$\frac{L - ax}{-b} = y^2$$

$$y^2 = \frac{ax - L}{b}$$

$$y = \pm \sqrt{\frac{ax - L}{b}}$$

Simplify.

4. (8pts) $\frac{2x}{3x^2 + 11x - 4} - \frac{x}{x^2 + 6x + 8} =$

prod = -12 12, -1
sum = 11

$$3x^2 + 12x - x - 4$$

$$= 3x(x + 4) - (x + 4)$$

$$= (3x - 1)(x + 4) \rightarrow \text{LCD is } (3x - 1)(x + 4)(x + 2)$$

$$\frac{2x(x + 2) - x(3x - 1)}{(3x - 1)(x + 4)(x + 2)}$$

$$= \frac{2x^2 + 4x - (3x^2 - x)}{(3x - 1)(x + 4)(x + 2)}$$

$$= \frac{-x^2 + 5x}{(3x - 1)(x + 4)(x + 2)} = \frac{-x(x - 5)}{(3x - 1)(x + 4)(x + 2)}$$

5. (8pts) $\frac{\frac{x}{2} - \frac{1}{3}}{\frac{5}{6x} + 1} = \frac{\frac{3x - 2}{6}}{\frac{5 + 6x}{6x}} = \frac{3x - 2}{6} \cdot \frac{6x}{5 + 6x} = \frac{x(3x - 2)}{6x + 5}$

Simplify, showing intermediate steps. Assume variables can be any real numbers.

6. (2pts) $\sqrt{162} = \sqrt{81 \cdot 2} = 9\sqrt{2}$

7. (4pts) $\sqrt{28x^5y^6} = \sqrt{4 \cdot 7 \cdot \overbrace{x^4}^{(x^2)^2} \cdot x \cdot (y^3)^2} = 2\sqrt{7|x^2|}\sqrt{x|y^3|}$
 $= 2x^2|y^3|\sqrt{7x} = 2x^2|y|^3\sqrt{7x}$

8. (5pts) $\frac{\sqrt{45x^3y^7}}{\sqrt{20xy^4}} = \sqrt{\frac{45x^3y^7}{20xy^4}} = \sqrt{\frac{9x^2y^3}{4}} = \frac{\sqrt{9x^2y^3} \cdot y}{\sqrt{4}} = \frac{3|x||y|\sqrt{y}}{2}$
 $= \frac{3|xy|\sqrt{y}}{2}$

9. (8pts) Simplify. Express answers first in terms of positive exponents, then convert to root notation.

$$\frac{(x^{\frac{1}{3}}y^{-\frac{3}{4}})^2}{(x^4y^{\frac{1}{2}})^{\frac{1}{2}}} = \frac{(x^{\frac{1}{3}})^2 (y^{-\frac{3}{4}})^2}{(x^4)^{\frac{1}{2}} (y^{\frac{1}{2}})^{\frac{1}{2}}} = \frac{x^{2 \cdot \frac{1}{3}} y^{-\frac{3}{4} \cdot 2}}{x^{4 \cdot \frac{1}{2}} y^{\frac{1}{2} \cdot \frac{1}{2}}} = \frac{x^{\frac{2}{3}} y^{-\frac{3}{2}}}{x^2 y^{\frac{1}{4}}}$$

$$= x^{\frac{2}{3}-2} y^{-\frac{3}{2}-\frac{1}{4}} = x^{\frac{2-6}{3}} y^{\frac{-6-1}{4}} = x^{-\frac{4}{3}} y^{-\frac{7}{4}} = \frac{1}{x^{\frac{4}{3}} y^{\frac{7}{4}}} = \frac{1}{\sqrt[3]{x^4} \sqrt[4]{y^7}}$$

10. (6pts) Simplify.

$$(\sqrt{3} + 2\sqrt{5})(3\sqrt{5} - 4\sqrt{3}) = 3\sqrt{15} - 4\sqrt{3}^2 + 6\sqrt{5}^2 - 8\sqrt{15}$$

$$= 3\sqrt{15} - 12 + 30 - 8\sqrt{15}$$

$$= 18 - 5\sqrt{15}$$

11. (5pts) Rationalize the denominator.

$$\frac{\sqrt{7}-2}{\sqrt{7}+5} \cdot \frac{\sqrt{7}-5}{\sqrt{7}-5} = \frac{\sqrt{7}^2 - 5\sqrt{7} - 2\sqrt{7} + 10}{\sqrt{7}^2 - 5^2} = \frac{7 - 7\sqrt{7} + 10}{7 - 25}$$

$$= \frac{17 - 7\sqrt{7}}{-18} = \frac{7\sqrt{7} - 17}{18}$$