1) $121x^2 - 81y^2$

$(11x - 9y)(11y + 9y)$

1b) $7x^2 - 25x - 12$

$7x^2 - 28x + 3x - 12$

$7x(x-4) + 3(x-4)$

$(x-4)(7x+3)$

7 (3)(4)

$ac = (7)(-12)$

$= -84$

two numbers add to -25

$= (-21)(4)$

$= (-28)(3)$

2) $6x^2 + x - 12 = 0$

$ac = -72$

$(+9)(-8)$

$6x^2 + 9x - 8x - 12 = 0$

$3x(2x+3) - 4(2x+3) = 0$

$(3x-4)(2x+3) = 0$

$3x - 4 = 0$

$3x = 4$

$x = \frac{4}{3}$

$2x + 3 = 0$

$2x = -3$

$x = -\frac{3}{2}$

3) $\frac{8x}{3x-10}$

$3x-10=0$

$3x=10$

$x=\frac{10}{3}$

$\frac{x^2+7x+6}{x^2+7x+12} = \frac{(x+6)(x+1)}{(x+3)(x+4)}$

$x+3=0$ $\quad x+4=0$

$x=-3$ $\quad x=-4$

4) $\frac{x^2+2x-3}{x^2-3x-18} = \frac{(x+3)(x-1)}{(x-6)(x+3)} = \frac{x-1}{x-6}$

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

$= \frac{x}{5(x+1)}$

5) $\frac{x+7}{3(2x+1)} \cdot \frac{(3)(3)}{(x-7)(x+7)} = \frac{3}{(2x+1)(x-7)}$

6) $\frac{x(x+6)}{(x+6)(x-6)} \cdot \frac{(x-3)(x-6)}{(x-6)}$

$\frac{x(x-3)}{(x-6)}$

7) $\frac{3x+21}{x+7} = \frac{3(x+7)}{x+7} = 3$

$\frac{9-(-5)}{x+1} = \frac{14}{x+1}$

9) $$\frac{5}{(x+3)} + \frac{6}{x}\cdot\frac{(x+3)}{(x+3)}$$

$$\frac{5x + 6(x+3)}{(x+3)(x)} = \frac{11x+18}{x(x+3)}$$

10) $$\frac{\frac{1}{36}\cdot\frac{x^2}{x^2} - \frac{1}{x^2}\cdot\frac{36}{36}}{\frac{1}{6}\cdot\frac{x}{x} + \frac{1}{x}\cdot\frac{6}{6}}$$

$$\frac{\frac{x^2-36}{36x^2}}{\frac{x+6}{6x}} = \frac{(x-6)(x+6)}{36x^2}\cdot\frac{6x}{(x+6)}$$

$$= \frac{6x(x-6)}{6\cdot 6\cdot x\cdot x}$$

$$= \frac{x-6}{6x}$$

11. $\frac{3}{x-9} + \frac{4}{x+9} = \frac{-72}{x^2-81}$ $\quad x \neq 9, -9$

$$\frac{3(x+9)(x-9)}{(x-9)} + \frac{4(x+9)(x-9)}{x+9} = \frac{-72(x+9)(x-9)}{(x+9)(x-9)}$$

$$3(x+9) + 4(x-9) = -72$$
$$3x + 27 + 4x - 36 = -72$$
$$7x - 9 = -72$$
$$\frac{7x}{7} = \frac{-63}{7}$$
$$\boxed{x = -9} \quad \text{but } x \neq -9$$

12. $\frac{2}{x+2} = \frac{3}{2x+5}$

$$2(2x+5) = 3(x+2)$$
$$4x + 10 = 3x + 6$$
$$x = -4$$

13. $\frac{\text{actual}}{\text{shadow}} = \frac{\text{actual}}{\text{shadow}}$

$\frac{6}{3.5} = \frac{x}{8}$

$48 = 3.5x$

$x = \frac{48}{3.5}$ $\quad x = 13.7$ ft.

✓ $\frac{2}{-4+2} = \frac{3}{2(-4)+5}$

$\frac{2}{-2} = \frac{3}{-3}$ ✓