

1. (11pts) Use formulas to expand:

a) $(3x - 2)(3x + 2) = (3x)^2 - 2^2 = 9x^2 - 4$

b) $(4x - 5)^2 = (4x)^2 - 2 \cdot 4x \cdot 5 + 5^2 = 16x^2 - 40x + 25$

c) $(x^2 + 7y)^2 = (x^2)^2 + 2 \cdot x^2 \cdot 7y + (7y)^2 = x^4 + 14x^2y + 49y^2$

d) $(x + 4)^3 = x^3 + 3x^2 \cdot 4 + 3x \cdot 4^2 + 4^3 = x^3 + 12x^2 + 48x + 64$

2. (8pts) Factor the following. Use either a known formula or a factoring method.

a) $x^2 - 5x - 14 = (x - 7)(x + 2)$

$$\begin{array}{l} \text{prod} = -14 \quad -7, 2 \\ \text{sum} = -5 \end{array}$$

b) $2x^2 - 9x - 18 = 2x^2 - 12x + 3x - 18 = 2x(x - 6) + 3(x - 6) = (2x + 3)(x - 6)$

AC = -36

$$\begin{array}{l} \text{prod} = -36 \quad | \quad -12, -3 \quad | \quad -12, 3 \\ \text{sum} = -9 \quad | \quad \times \quad | \quad \checkmark \end{array}$$

c) $x^3 - 125 = x^3 - 5^3 = (x - 5)(x^2 + 5x + 25)$

3. (3pts) Verify the formula for the difference of cubes by multiplying out:

$$\begin{aligned}
 (x-a)^3 &= (x-a)^2(x-a) = (x^2 - 2xa + a^2)(x-a) \\
 &= x^3 - \underline{2x^2a} + \underline{a^2x} - \underline{ax^2} + \underline{2xa^2} - a^3 \\
 &= x^3 - 3x^2a + 3xa^2 - a^3
 \end{aligned}$$

4. (8pts) Simplify.

$$\begin{aligned}
 \text{a) } \frac{x-5}{x^2-2x-8} + \frac{2x}{x^2-16} &= \frac{x-5}{(x-4)(x+2)} + \frac{2x}{(x-4)(x+4)} = \\
 &= \frac{(x-5)(x+4) + 2x(x+2)}{(x-4)(x+2)(x+4)} \\
 &= \frac{x^2 - x - 20 + 2x^2 + 4x}{(x-4)(x+2)(x+4)} = \frac{3x^2 + 3x - 20}{(x-4)(x+2)(x+4)}
 \end{aligned}$$

AC = -60

prod = -60

sum = 3

doesn't factor

$$\begin{aligned}
 \text{b) } \frac{x + \frac{2x-6}{x-1}}{4 + \frac{16}{x-1}} &= \frac{\frac{x(x-1) + 2x-6}{x-1}}{\frac{4(x-1) + 16}{x-1}} = \frac{x^2 + x - 6}{x-1} \cdot \frac{x-1}{4x+12} \\
 &= \frac{(x+2)\cancel{(x-1)}\cancel{(x-1)}}{\cancel{(x-1)} 4(x+3)} = \frac{x-2}{4}
 \end{aligned}$$