

Lesson 2.3 Factoring Polynomials

Warm Up:

State whether the following pairs of expressions are equivalent or not:

1. $(2 - x)^5$ and $(x - 2)^5$

$$\begin{aligned} &= (-1)^5(x-2)^5 \\ &= -(x-2)^5 \end{aligned} \quad \therefore (2-x)^5 \neq (x-2)^5$$

↑
not equivalent

2. $9(3 - x)^2$ and $(9 - 3x)^2$

$$\begin{aligned} &= 3^2(3-x)^2 \\ &= 9(3-x)^2 \end{aligned} \quad \therefore 9(3-x)^2 = (9-3x)^2$$

↑
equivalent

3. $(1 - 5x)^{99}$ and $(5x - 1)^{99}$

$$\begin{aligned} &= (-1)^{99}(5x-1)^{99} \\ &= -(5x-1)^{99} \end{aligned} \quad \therefore \text{not equivalent}$$

4. $32(1 - x)^5$ and $(2 - 2x)^5$

$$\begin{aligned} &= 2^5(1-x)^5 \\ &= 32(1-x)^5 \end{aligned} \quad \therefore \text{equivalent}$$

5. $\frac{2+x}{3} - \frac{3+x}{4}$ and $\frac{x-1}{12}$

$$= \frac{4(2+x)}{12} - \frac{3(3+x)}{12}$$

$$= \frac{8+4x}{12} - \frac{9+3x}{12}$$

$$= \frac{8+4x-(9+3x)}{12}$$

$$= \frac{8+4x-9-3x}{12}$$

$$= \frac{-1+x}{12}$$

$$= \frac{x-1}{12}$$

↑
∴ equivalent

Skills Check – self assessment

Name: _____

Date: _____

1. Expand and simplify

a) $3x(x-4) - x(x+5) - 2x(x-1)$. b) $2(x+3)(x+5)$

[3, 2] $(3x^2 - 12x) - (x^2 + 5x) - (2x^2 - 2x) = (2x+6)(x+5)$
 $= 3x^2 - 12x - x^2 - 5x - 2x^2 + 2x = 2x^2 + 10x + 6x + 30$
 $= -15x$ ✓ $= 2x^2 + 16x + 30$ ✓

$5(3t-1)(3t-1)$ c) $5(3t-1)^2 - 4(4t-5)(4t+5)$
 [5] $= 5(9t^2 - 3t - 3t + 1) - 4(16t^2 - 25)$
 $= 45t^2 - 30t + 5 - 64t^2 + 100$ ✓
 $= -19t^2 - 30t + 105$ ✓

2. Multiply $(2xy)(-3x^2y^3)(-3x^2)$.

[1] $= (-6x^3y^4)(-3x^2)$
 $= 18x^5y^4$ ✓

3. Divide $\frac{-75s^3t^3 - 25s^2t^2}{5st}$.

[2] $= \frac{-5st(-25s^2t^3 - 5s^2t^2)}{5st}$ ← factor first
 $= -5st(3t^3 + 1)$

or $= -15st^4 - 5st$

4. Factor the following.

[1,3] a) $15a^3b^6c^2 - 9a^3bc + 3abc$
 $= \underline{3abc(5a^2b^5c - 3a + 1)}$

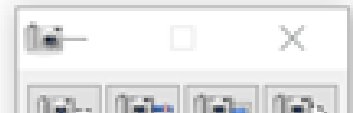
b) $3x^2 - 30x + 27$
 $= 3(x^2 - 10x + 9)$
 $= 3(x-1)(x-9)$

[1,2] c) $4t(m+7) + (m+7)$
 $= 4ty + y$
 $= y(4t + 1)$
 $= (m+7)(4t+1)$
 e) $(x+a)^2 + 6(x+a) + 8$

d) $x^2 + x - xy - y$
 $= x(x+1) - y(x+1)$
 $= \underline{(x+1)(x-y)}$

could let $m+7 = y$

[4] let $x+a = y$
 $y^2 + 6y + 8$
 $= (y+4)(y+2)$
 $= (x+a+4)(x+a+2)$



$$\text{Factor } 9x^2 + 30x - y^2 + 25$$

$$= 9x^2 + 30x + 25 - y^2$$

$$= (3x + 5)^2 - y^2$$

$$\text{let } 3x + 5 = m$$

$$= m^2 - y^2$$

$$= (m + y)(m - y)$$

$$= (3x + 5 + y)(3x + 5 - y)$$

HW p102 #4-7, 9, 12