

### 6.3 Factoring by Grouping

1)

	$3x^2$	$1$
$x$	$3x^3$	$x$
$6$	$18x^2$	$6$

$x^2 + x + 6$

b) Suppose  $x = 2$ .

$$(x + 6)(3x^2 + 1) = [(2) + 6] [3(2)^2 + 1] = (8)(12 + 1) = (8)(13) = 104$$

$$3x^3 + 18x^2 + x + 6 = 3(2)^3 + 18(2)^2 + (2) + 6 = 24 + 72 + 2 + 6 = 104$$

3)

$$(x + 7)(4x - 9)$$

$$= x(4x - 9) + 7(4x - 9)$$

$$= 4x^2 - 9x + 28x - 63$$

$$= 4x^2 + 19x - 63$$

Add like terms

Graph  $Y_1 = (x + 7)(4x - 9)$  and  $Y_2 = 4x^2 + 19x - 63$  and note that both functions have the same graph.

5)

$$(y + 3)(y^2 - 3y + 9)$$

$$= y(y^2 - 3y + 9) + 3(y^2 - 3y + 9)$$

$$= y^3 - 3y^2 + 9y + 3y^2 - 9y + 27$$

$$= y^3 + 0y^2 + 0y + 27$$

$$= y^3 + 27$$

7)

	$1$	$2y$
$6$	$6$	$12y$
$-x$	$-x$	$-2xy$

$(x - 6)(x - 2y) = x^2 - 2xy - 6x + 12y$

9)

$$-5x + 20 + xy - 4y$$

$$= (-5x + 20) + (xy - 4y) \quad \text{Form groups of two terms}$$

$$= (-5)(x - 4) + y(x - 4) \quad \text{Find the GCF for both groups}$$

$$= (-5 + y)(x - 4)$$

Factor out the common binomial factor  $(x - 4)$

11)

B)

	3	$-y$
$x$	$3x$	$-xy$
2	6	$-2y$

C)

	$x$	2
3	$3x$	6
$-y$	$-xy$	$-2y$

D)

	3	$-y$
2	6	$-2y$
$x$	$3x$	$-xy$

By area models (B), (C), and (D), we see  $3x - xy + 6 - 2y = (x + 2)(3 - y)$ .

13) Not factorable; there is no way to pair the terms so that the product of one pair equals the product of the other pair.

15)

$$\begin{aligned} \text{a)} \quad (a - b)^2 &= [a + (-b)]^2 \\ &= a^2 + 2(a)(-b) + (-b)^2 \\ &= a^2 - 2ab + b^2 \end{aligned}$$

$$\begin{aligned} \text{b)} \quad (2x + y)^2 &= (2x)^2 + 2(2x)(y) + (y)^2 \\ &= 4x^2 + 4xy + y^2 \end{aligned}$$

$$\begin{aligned} \text{c)} \quad (3x - 7y)^2 &= [3x + (-7y)]^2 \\ &= (3x)^2 + 2(3x)(-7y) + (-7y)^2 \\ &= 9x^2 - 42xy + 49y^2 \end{aligned}$$

### Skill and Review

$$\begin{aligned} 17) \quad & \frac{2}{3}x - \frac{1}{4} = \frac{5}{6} \\ & 12 \left( \frac{2}{3}x - \frac{1}{4} \right) = 12 \cdot \frac{5}{6} \\ & 12 \cdot \frac{2}{3}x - 12 \cdot \frac{1}{4} = 12 \cdot \frac{5}{6} \\ & 8x - 3 = 10 \\ & 8x = 13 \\ & x = \frac{13}{8} = 1.625 \end{aligned}$$

$$\begin{aligned} 19) \quad & 4x^3 + x^2(x - 2) + 3x^2 \\ & = 4x^3 + x^3 - 2x^2 + 3x^2 \\ & = 5x^3 + x^2 \end{aligned}$$