

# Unit #3 Test: Polynomials & Algebraic Techniques

MPM2D

Name: solutions

## Marking Summary:

Total Marks: 82

Knowledge/Understanding: questions #1-6

Application: questions #7

Thinking/Inquiry and Problem Solving: #8

1. Expand and simplify the following.

[13 marks]

a)  $(x + 2)(x - 8)$  ✓

$= x^2 - 6x - 16$  ✓✓

b)  $3(x - 1)(5x + 2)$

$= (3x - 3)(5x + 2)$  ✓  
 $= 15x^2 - 9x - 6$  ✓✓

c)  $2(x + 4)^2$  ✓✓

$= 2(x^2 + 8x + 16)$   
 $= 2x^2 + 16x + 32$

d)  $(x + 3)^2 - 2(2x + 1)(3x - 4)$

$= x^2 + 6x + 9 - 2(6x^2 - 5x - 4)$  ✓✓✓  
 $= x^2 + 6x + 9 - 12x^2 + 10x + 8$   
 $= -11x^2 + 16x + 17$

2. Factor each of the following. [6 marks]

a)  $12x^2 - 4x$

$= 4x(3x - 1)$

b)  $9n^2 - 16$

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

c)  $x^2 + 7x + 12$

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

3. Fill in the blanks to make each of the following expressions perfect squares. [3 marks]

a)  $x^2 + \underline{10}x + 25$

b)  $9n^2 + \underline{54}n + 81$

c)  $x^2 + 12x + \underline{36}$

4. Factor each of the following. [27 marks]

a)  $x^2 + 9x + 20$

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

b)  $7x^2 + 49x$

$$= 7x(x+7)$$

c)  $4x^2 - 1$

$$= (2x-1)(2x+1)$$

d)  $3x^2 - 4x - 7$

$$= (3x-7)(x+1)$$

e)  $-x^2 + 5x + 24$

$$= -(x^2 - 5x - 24)$$

$$= -(x-8)(x+3)$$

f)  $30m^2 - 13m - 3$

$$= (6m+1)(5m-3)$$

g)  $2x^2 - 14x - 16$

$$= 2(x^2 - 7x - 8)$$

$$= 2(x-8)(x+1)$$

h)  $9a^2 - 6a + 1$

$$= (3a-1)^2$$

i)  $12x^2 - 11x + 2$

$$= (3x-2)(4x-1)$$

5. Only two of the following expressions can be factored. Identify which ones can be factored (by circling them), then factor them below. [5 marks]

$\circledast$   $4x^2 - 9$

$2x^2 + 4x - 1$

$\circledast$   $2x^2 - 4x - 3$

$x^2 + 9$

$x^2 + 4x - 1$

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

~~$$= (2x+1)(x-3)$$~~

$$= (2x-3)(x+1)$$

6. Factor each of the following. (HINT: factor by grouping). [6 marks]

a)  $m^3 + m^2 + 3m + 3$

$$= m^2(m+1) + 3(m+1)$$

$$= (m+1)(m^2+3)$$

b)  $6y^4 - 3y^3 - 2y + 1$

$$= 3y^3(2y-1) - 1(2y-1)$$

$$= (2y-1)(3y^3-1)$$

7. Solve each of the following equations. [16 marks]

a)  $a^2 - 2a - 11 = 4$

$$a^2 - 2a - 15 = 0$$

$$(a-5)(a+3) = 0$$

$$a = 5, a = -3$$

b)  $4x^2 = 12x - 9$

$$4x^2 - 12x + 9 = 0$$

$$(2x-3)^2 = 0$$

$$2x-3 = 0$$

$$2x = 3$$

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

c)  $2x^2 = 11x + 6$

$$2x^2 - 11x - 6 = 0$$

$$(2x+1)(x-6) = 0$$

$$2x+1 = 0 \quad x-6 = 0$$

$$2x = -1 \quad x = 6$$

$$x = -\frac{1}{2}$$

d)  $(m+2)^2 - (2m+3)^2 = -8$

$$(m^2 + 4m + 4) - (4m^2 + 12m + 9) = -8$$

$$-3m^2 - 8m - 5 = -8$$

$$-3m^2 - 8m + 3 = 0$$

$$3m^2 + 8m - 3 = 0$$

$$(3m-1)(m+3) = 0$$

$$3m-1 = 0 \quad \text{or} \quad m+3 = 0$$

$$m = \frac{1}{3}$$

8. Factor the following. [6 marks]

a)  $x^3 - 5x^2 - 50x$

$$= x(x^2 - 5x - 50)$$

$$= x(x - 10)(x + 5)$$

b)  $x^2 + 3xy - 28y^2$

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