

**LESSON 4.4 Skills Practice**


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Name \_\_\_\_\_ Date \_\_\_\_\_

**Break It Down**  
**Factoring Higher Order Polynomials**
**Problem Set**

Factor each expression completely.

1.  $x^2 + 12x - 13$

$x^2 + 12x - 13 = (x + 13)(x - 1)$

2.  $x^2 + 6x + 8$

3.  $x^2 - 12x - 28$

4.  $x^2 + 30x + 81$

5.  $x^2 - 5x - 14$

6.  $x^2 - 16x - 36$

4

Factor each expression by factoring out the greatest common factor.

7.  $2x^5 - 8x^4 + 10x^3$

$2x^3 - 8x^4 + 10x^3 = 2x^3(x^2 - 4x + 10)$

8.  $-9x^4 + 45x^3 - 9x^2$

9.  $105x^3 - 147x$

10.  $-\frac{3}{5}x^4 + \frac{3}{5}x^3 - \frac{27}{5}x^2$  \_\_\_\_\_

11.  $\frac{1}{3}x^4 - \frac{8}{3}x^3 + \frac{1}{3}x^2 - \frac{11}{3}x$  \_\_\_\_\_

12.  $8x^4 - 16x^3 + 56x^2 - 24x$  \_\_\_\_\_

**LESSON 4.4 Skills Practice**

page 2

Factor each expression completely using the chunking method.

13.  $4x^2 + 8x + 3$

$$4x^2 + 8x + 3 = (2x)^2 + 4(2x) + 3$$

$$\text{Let } z = 2x$$

$$= z^2 + 4z + 3$$

$$= (z + 1)(z + 3)$$

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

14.  $25x^2 - 35x + 12$

15.  $121x^2 - 44x - 12$

16.  $49x^2 + 63x + 18$

**4**

17.  $9x^2 + 30x - 11$

18.  $169x^2 - 130x + 24$

**LESSON 4.4** Skills Practice

page 3

Name \_\_\_\_\_ Date \_\_\_\_\_

Factor each expression completely using the factor by grouping method.

19.  $x^3 - 2x^2 + 3x - 6$

$$\begin{aligned}x^3 - 2x^2 + 3x - 6 &= x^2(x - 2) + 3(x - 2) \\ &= (x^2 + 3)(x - 2) \\ &= (x + i\sqrt{3})(x - i\sqrt{3})(x - 2)\end{aligned}$$

20.  $x^3 + x^2 - 4x - 4$

21.  $x^3 - 6x^2 - 9x + 54$

**4**

22.  $x^4 - 3x^3 - x^2 - 3x$

23.  $-x^3 + 5x^2 + 16x - 80$

24.  $x^3 - 3x^2 - 4x + 12$

**LESSON 4.4** Skills Practice

page 4

Factor each quartic expression completely using the quadratic form method.

25.  $x^4 - 13x^2 + 36$

$$\begin{aligned}x^4 - 13x^2 + 36 &= (x^2 - 4)(x^2 - 9) \\ &= (x - 2)(x + 2)(x - 3)(x + 3)\end{aligned}$$

26.  $x^4 - 50x^2 + 49$

27.  $x^4 - 29x^2 + 100$

**4**

28.  $x^4 - 25x^2 + 144$

29.  $x^4 - 164x^2 + 6,400$

30.  $x^4 - 61x^2 + 900$

**LESSON 4.4 Skills Practice**

page 5

Name \_\_\_\_\_ Date \_\_\_\_\_

Factor each binomial using the sum or difference of perfect cubes formula.

31.  $x^3 + 27$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$x^3 + 27 = (x)^3 + (3)^3$$

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

32.  $x^3 - 8y^3$

33.  $8x^3 - 125$

4

34.  $x^3 + 64y^3$

35.  $343x^3 - 1$

36.  $216x^3 + 125y^3$

**LESSON 4.4 Skills Practice**

page 6

Factor each binomial completely over the set of real numbers using the difference of squares method.

37.  $x^2 - 100$

$$a^2 - b^2 = (a + b)(a - b).$$

$$x^2 - 100 = (x + 10)(x - 10)$$

38.  $x^4 - 36$

39.  $49x^2 - 4y^2$

**4**

40.  $x^{10} - 81$

41.  $9x^4 - 121y^2$

42.  $4x^{14} - 9y^8$

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page 7

Name \_\_\_\_\_ Date \_\_\_\_\_

Factor each perfect square trinomial.

43.  $4x^2 + 12x + 9$

$$a^2 + 2ab + b^2 = (a + b)^2$$

$$4x^2 + 12x + 9 = (2x)^2 + 2(2x)(3) + (3)^2$$
$$= (2x + 3)^2$$

44.  $x^2 - 12xy + 36y^2$

45.  $16x^2 + 104x + 169$

**4**

46.  $25x^2 + 80x + 64$

47.  $9x^4 + 42x^2y + 49y^2$

48.  $64x^2 + 16xy^2 + y^4$