

# #1-18 ALL

Name Solutions

## Factoring: All Techniques Combined (Hard)

Date \_\_\_\_\_ Period \_\_\_\_\_

Factor each.

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

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

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

$$\underline{(x-5)(x+1)(x-1)}$$

2)  $x^4 - 2x^2 - 15$

$$\begin{array}{r} -15 \\ 3 \overline{) 15} \end{array}$$

$$\underline{(x^2-5)(x^2+3)}$$

3)  $x^6 - 26x^3 - 27$

$$\begin{array}{r} -27 \\ -27 \overline{) 27} \end{array}$$

$$(x^6 - 27x^3) + (x^3 - 27)$$

$$x^3(x^3 - 27) + 1(x^3 - 27)$$

$$(x^3+1)(x^3-27)$$

$$\underline{(x+1)(x^2-x+1)(x-3)(x^2+3x+9)}$$

4)  $(x^6 + 2x^4)(-16x^2 - 32)$

$$x^4(x^2+2) - 16(x^2+2)$$

$$(x^2+2)(x^4-16)$$

$$(x^2+2)(x^2+4)(x^2-4)$$

$$\underline{(x^2+2)(x^2+4)(x+2)(x-2)}$$

5)  $x^4 - 13x^2 + 40$

$$\begin{array}{r} 40 \\ -5 \overline{) 40} \end{array} (x^4 - 5x^2)(8x^2 + 40)$$

$$x^2(x^2-5) - 8(x^2-5)$$

$$\underline{(x^2-8)(x^2-5)}$$

6)  $x^9 - x^6 - x^3 + 1$

$$x^6(x^3-1) - 1(x^3-1)$$

$$(x^6-1)(x^3-1)$$

$$(x^3+1)(x^3-1)(x^3-1)$$

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

OR  $(x+1)(x^2-x+1)(x-1)^2(x^2+x+1)^2$

7)  $x^6 - 4x^2$

$$x^2(x^4-4)$$

$$\underline{x^2(x^2+2)(x^2-2)}$$

8)  $x^4 + 14x^2 + 45$

$$\begin{array}{r} 45 \\ 9 \overline{) 45} \end{array} (x^4 + 5x^2)(9x^2 + 45)$$

$$x^2(x^2+5) + 9(x^2+5)$$

$$\underline{(x^2+9)(x^2+5)}$$

$$\begin{array}{r} -12 \\ -3 \overline{) 4} \end{array} \quad 9) 2x^4 + x^2 - 6$$

$$(2x^4 + 4x^2) - (3x^2 + 6)$$

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

$$\underline{(2x^2 - 3)(x^2 + 2)}$$

$$11) (4x^3 - x^2)(-4x + 1)$$

$$x^2(4x - 1) - 1(4x - 1)$$

$$(4x - 1)(x^2 - 1)$$

$$\underline{(4x - 1)(x + 1)(x - 1)}$$

$$13) 5x^2 + 24x - 5$$

$$\begin{array}{r} -25 \\ 25 \overline{) -1} \end{array} \quad (5x^2 + 25x)(-x - 5)$$

$$5x(x + 5) - 1(x + 5)$$

$$\underline{(x + 5)(5x - 1)}$$

$$15) 4x^2 + 4x - 15$$

$$\begin{array}{r} -60 \\ -6 \overline{) 10} \end{array} \quad (4x^2 - 6x)(x + 10x - 15)$$

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

$$\underline{(2x - 3)(2x + 2)}$$

$$17) (27x^9 + x^6)(27x^3 - 1)$$

$$x^6(27x^3 + 1) - 1(27x^3 + 1)$$

$$x^6 - 1)(27x^3 + 1)$$

$$(x^3 + 1)(x^3 - 1)(27x^3 + 1)$$

$$\underline{(x + 1)(x^2 - x + 1)(x - 1)(x^2 + x + 1)(3x + 1)(9x^2 - 3x + 1)}$$

$$\begin{array}{r} 40 \\ 10 \overline{) 4} \\ -5 \overline{) 8} \end{array}$$

$$10) 2x^2 - 13x + 20$$

$$(2x^2 - 8x) - (5x + 20)$$

$$2x(x - 4) - 5(x - 4)$$

$$\underline{(2x - 5)(x - 4)}$$

$$\begin{array}{r} 900 \\ 18 \overline{) 50} \\ 9 \overline{) 100} \\ 90 \overline{) 10} \\ 45 \overline{) 20} \\ 25 \overline{) 36} \end{array}$$

$$12) 4x^8 - 61x^4 + 225$$

$$4x^8 - 36x^4 - 25x^4 + 225$$

$$4x^4(x^4 - 9) - 25(x^4 - 9)$$

$$(4x^4 - 25)(x^4 - 9)$$

$$\underline{(2x^2 + 5)(2x^2 - 5)(x^2 + 3)(x^2 - 3)}$$

$$\begin{array}{r} 225 \\ x \overline{) 4} \\ 900 \end{array}$$

$$\begin{array}{r} 1 \\ 9 \overline{) 100} \end{array}$$

$$\begin{array}{r} 3 \overline{) 3} \quad 10 \overline{) 10} \\ 2 \overline{) 2} \quad 5 \overline{) 5} \end{array}$$

$$\begin{array}{r} 100 \\ 25 \overline{) 4} \end{array}$$

$$14) 5x^2 + 29x + 20$$

$$5x^2 + 25x + 4x + 20$$

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

$$\underline{(x + 5)(5x + 4)}$$

$$16) (10x^3 - 8x^2)(25x - 20)$$

$$2x^2(5x - 4) + 5(5x - 4)$$

$$\underline{(5x - 4)(2x^2 + 5)}$$

$$\begin{array}{r} -24 \\ 4 \overline{) 6} \\ -2 \overline{) 12} \end{array}$$

$$18) 8x^4 + 10x^2 - 3$$

$$(8x^4 + 12x^2) - (2x^2 - 3)$$

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

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

$$\underline{(2x^2 + 3)(2x + 1)(2x - 1)}$$