

1. Factor the following Differences of Squares.

a. $x^2 - 49$

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

d. $x^2 - 16$

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

b. $m^2n^2 - 4$

$$= (mn - 2)(mn + 2)$$

e. $3y^4 - 75$

$$= 3(y^4 - 25)$$

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

c. $4z^2 - 9$

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

f. $5y^4 - 80$

$$= 5(y^4 - 16)$$

$$= 5(y^2 + 4)(y^2 - 4)$$

$$= 5(y^2 + 4)(y - 2)(y + 2)$$

2. Factor the following Perfect Square Trinomials.

a. $x^2 + 6x + 9$

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

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

b. $4x^2 - 20xy + 25y^2$

$$= (2x - 5y)(2x - 5y)$$

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

$$\begin{aligned} \text{c. } & 16q^2 + 56q + 49 \\ &= (4q + 7)(4q + 7) \\ &= (4q + 7)^2 \end{aligned}$$

$$\begin{aligned} \text{g. } & 81t^2 - 18t + 1 \\ &= (9t - 1)^2 \end{aligned}$$

$$\begin{aligned} \text{d. } & x^2 + 20x + 100 \\ &= (x + 10)^2 \end{aligned}$$

$$\begin{aligned} \text{h. } & 20x^2 + 20x + 5 \\ &= 5(4x^2 + 4x + 1) \\ &= 5(2x + 1)^2 \end{aligned}$$

$$\begin{aligned} \text{e. } & 4y^2 - 20y + 25 \\ &= (2y - 5)^2 \end{aligned}$$

$$\begin{aligned} \text{i. } & 90r^{10} - 60r^9 + 10r^8 \\ &= 10r^8(9r^2 - 6r + 1) \\ &= 10r^8(3r - 1)^2 \end{aligned}$$

$$\begin{aligned} \text{f. } & 36r^2 + 12r + 1 \\ &= (6r + 1)^2 \end{aligned}$$

$$\begin{aligned} \text{j. } & 16x^8 - 8x^7 + x^6 \\ &= x^6(16x^2 - 8x + 1) \\ &= x^6(4x - 1)^2 \end{aligned}$$

3. Factor the following polynomials completely using any factoring methods necessary.

a. $-3y - 3$

$$= -3(y + 1)$$

e. $4y^2 + 3yt - 7t^2$

$$= 4y^2 - 4yt + 7yt - 7t^2$$

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

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

$$4 \cdot (-7) = -28$$

$$\begin{array}{r} -4 \\ +7 \\ \hline = 3 \end{array}$$

b. $8xy + 8y$

$$= 8y(x + 1)$$

f. $15t^2 - 3t - 12$

$$= 3(5t^2 - t - 4)$$

$$= 3(5t^2 - 5t + 4t - 4)$$

$$= 3[5t(t - 1) + 4(t - 1)]$$

$$= 3(t - 1)(5t + 4)$$

$$5 \cdot (-4) = -20$$

$$\begin{array}{r} -5 \\ +4 \\ \hline = -1 \end{array}$$

c. $5y^2 - 2y - 7$

$$= \underline{5y^2 + 5y} - \underline{7y - 7}$$

$$= 5y(y + 1) - 7(y + 1)$$

$$= (y + 1)(5y - 7)$$

$$5(-7) = -35$$

$$\begin{array}{r} 5 \\ -7 \\ \hline = -2 \end{array}$$

g. $x^4 - 121$

$$= (x^2 - 11)(x^2 + 11)$$

d. $8t^2 + 22t + 15$

$$= 8t^2 + 10t + 12t + 15$$

$$= 2t(4t + 5) + 3(4t + 5)$$

$$= (4t + 5)(2t + 3)$$

$$8 \cdot 15 = 120$$

$$\begin{array}{r} 10 \\ +12 \\ \hline = 22 \end{array}$$

h. $x^6 - 36y^{14}$

$$= (x^3 - 6y^7)(x^3 + 6y^7)$$

$$\begin{aligned}
 \text{i. } & 3x^2r^3 - 147r \\
 & = 3r(x^2r^2 - 49) \\
 & = 3r(xr - 7)(xr + 7)
 \end{aligned}$$

$$\begin{aligned}
 \text{m. } & \underline{x^2 - 14x + 49} - 64y^2 \quad \text{prime} \\
 & = x(x - 14) + 49 - 64y^2
 \end{aligned}$$

$$\begin{aligned}
 \text{j. } & x^2 - 12xy + 36y^2 \\
 & = (x - 6y)^2
 \end{aligned}$$

$$\begin{aligned}
 \text{n. } & y^{12} - 49 \\
 & = (y^6 + 7)(y^6 - 7)
 \end{aligned}$$

$$\begin{aligned}
 \text{k. } & 4r^{10} + 4r^9 + r^8 \\
 & = r^8(4r^2 + 4r + 1) \\
 & = r^8(2r + 1)^2
 \end{aligned}$$

$$\begin{aligned}
 \text{o. } & 2x^2y^3 - 10xy^2 + 8y \\
 & = 2y(x^2y^2 - 5xy + 4) \\
 & = 2y(xy - 1)(xy - 4)
 \end{aligned}$$

$\begin{array}{c} +4 \\ -1 \quad -4 = -5 \end{array}$

$$\begin{aligned}
 \text{l. } & 2x^4 - 162 \\
 & = 2(x^4 - 81) \\
 & = 2(x^2 + 9)(x^2 - 9) \\
 & = 2(x^2 + 9)(x - 3)(x + 3)
 \end{aligned}$$

$$\begin{aligned}
 \text{p. } & 30r^4 - 12r^3 + 42r^2 \\
 & = 6r^2(\underbrace{5r^2 - 2r + 7}_{\text{prime}})
 \end{aligned}$$

$5 \cdot 7 = 35$
 $\begin{array}{c} 1 \quad 35 \\ 5 \quad 7 \end{array}$