

1. Factor completely: $2x^3 + 5x^2 - 3x$

$$\begin{aligned}
 &= x(2x^2 + 5x - 3) \\
 &= \boxed{x(2x-1)(x+3)}
 \end{aligned}$$

$2x^2 - x + 6x - 3$
 $= x(2x-1) + 3(2x-1)$
 $= (2x-1)(x+3)$

$(2)(-3)$
 $= -6$
 \wedge
 $-1, +6$

2. Factor completely: $8x^3 - 125y^3$

$$\begin{aligned}
 &\quad \quad \quad \uparrow \quad \quad \quad \uparrow \\
 &\quad \quad \quad A=2x \quad \quad \quad B=5y \\
 &= \boxed{(2x-5y)(4x^2+10xy+25y^2)}
 \end{aligned}$$

3. Factor completely: $3x^2 + 4xy - 7y^2$

$$\begin{aligned}
 &= 3x^2 - 3xy + 7xy - 7y^2 \\
 &= 3x(x-y) + 7y(x-y) \\
 &= \boxed{(x-y)(3x+7y)}
 \end{aligned}$$

$(3)(-7)$
 $= -21$
 \wedge
 $-3, +7$

4. Factor completely: $12x^4 - 46x^3 - 8x^2$

$$\begin{aligned}
 &= 2x^2(6x^2 - 23x - 4) \\
 &= \boxed{2x^2(6x+1)(x-4)}
 \end{aligned}$$

$6x^2 + x - 24x - 4$
 $= x(6x+1) - 4(6x+1)$
 $= (6x+1)(x-4)$

$(6)(-4)$
 $= -24$
 \wedge
 $+1, -24$

5. Factor completely: $x^2 - x + y - xy$

$$\begin{aligned}
 &= x(x-1) + y(1-x) \\
 &= x(x-1) - y(x-1) \\
 &= \boxed{(x-1)(x-y)}
 \end{aligned}$$

6. Factor completely: $4x^4 + 20x^2y^4 + 25y^8$

$$A = 2x^2 \quad B = 5y^4$$

$$2AB = 2(2x^2)(5y^4) = 20x^2y^4 \checkmark$$

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

7. Factor completely: $50x^2y^2 - 32y^2$

$$= 2y^2(25x^2 - 16)$$

$$A = 5x \quad B = 4$$

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

8. Factor completely: $3x^6 + 7x^3 + 2$

$$= 3u^2 + 7u + 2$$

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

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

$$\text{Let } u = x^3 \\ u^2 = x^6$$

$$\begin{array}{r} 3u^2 + 7u + 2 \\ \swarrow \quad \searrow \\ 3u^2 + u + 6u + 2 \\ \hline u(3u+1) + 2(3u+1) \\ (3u+1)(u+2) \end{array} \quad \begin{array}{l} (3)(2) \\ = 6 \\ \swarrow \searrow \\ +1 \quad +7 \end{array}$$

9. Factor completely: $16a^2x - 26y - 26x + 16a^2y$

$$= 2(8a^2x - 13y - 13x + 8a^2y)$$

$$= 2(8a^2x - 13x - 13y + 8a^2y)$$

$$= 2(x(8a^2 - 13) - y(13 - 8a^2))$$

↓ Factor out a -1

$$= 2(x(8a^2 - 13) + y(8a^2 - 13))$$

$$= 2(8a^2 - 13)(x + y)$$

10. Factor completely: $3x^{10} + 3x$

$$= 3x(x^9 + 1)$$

$$A = x^3 \quad B = 1$$

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

$$= 3x(x+1)(x^2 - x + 1)(x^6 - x^3 + 1)$$

11. Factor completely: $8x^3 - 27$

$$A = 2x \quad B = 3$$

$$= (2x - 3)(4x^2 + 6x + 9)$$

12. Factor completely: $64 + 125a^3b^6$

$$A = 4 \quad B = 5ab^2$$

$$= (4 + 5ab^2)(16 - 20ab^2 + 25a^2b^4)$$

13. Factor completely: $16x^2 + 49y^2$

prime

Q: A man is driving his son to school. They get into an accident and the man dies. The son is rushed to the hospital and when he arrives for emergency surgery the doctor says "I can't operate on this boy, HE'S MY SON!" The boy was not adopted. How is this possible?