2. **Given $z^2 + 2z - 15 = (z - 3)(z + 5)$, write another polynomial in general form that has a factored form of $(z - 3)(z + 5)$ with different values for $z$.**

A special form of a polynomial is a perfect square trinomial. A perfect square trinomial has first and last terms that are perfect squares and a middle term that is equivalent to 2 times the product of the first and last term's square root.

Factoring a perfect square trinomial can occur in two forms.

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

**3. Determine which of the polynomial expression(s) is a perfect square trinomial and write it as the square of a sum or difference. If it is not a perfect square trinomial, explain why not.**

**a. $x^4 + 14x^2 - 49$**

**b. $16x^2 - 40x + 100$**

**c.** $64x^2 - 32x + 4$

**d.** $9x^4 + 6x^2 + 1$

In polynomials of 4 terms, you may notice that although not all terms share a common factor, pairs of terms might share a common factor. In this situation, you can factor by grouping.

**4. Colt factors the polynomial expression $x^3 + 3x^2 - x - 3$.**

Colt

$x^3 + 3x^2 - x - 3$

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

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

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

**a. Explain the steps Colt took to factor the polynomial expression.**

$x^3 + 3x^2 - x - 3$

$x^2(x + 3) - 1(x + 3)$ **Step 1:** _____

_____

_____

$(x + 3)(x^2 - 1)$ **Step 2:** _____

_____

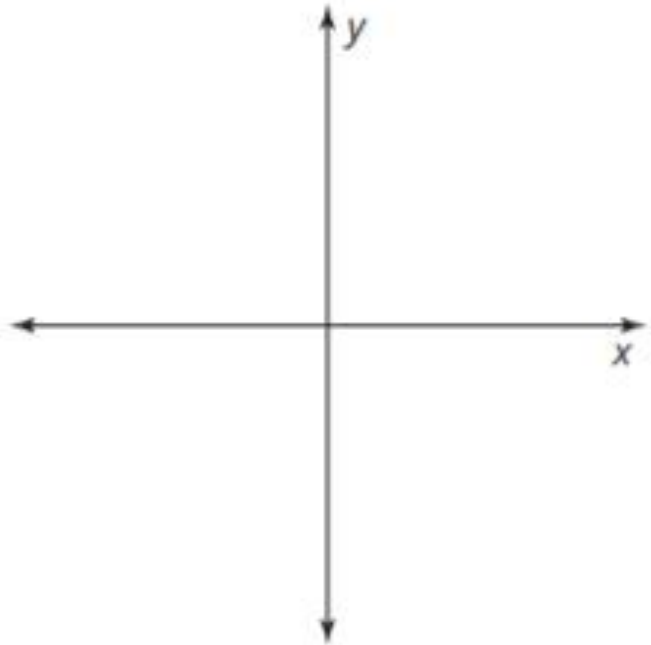
_____

$(x + 3)(x + 1)(x - 1)$ **Step 3:** _____

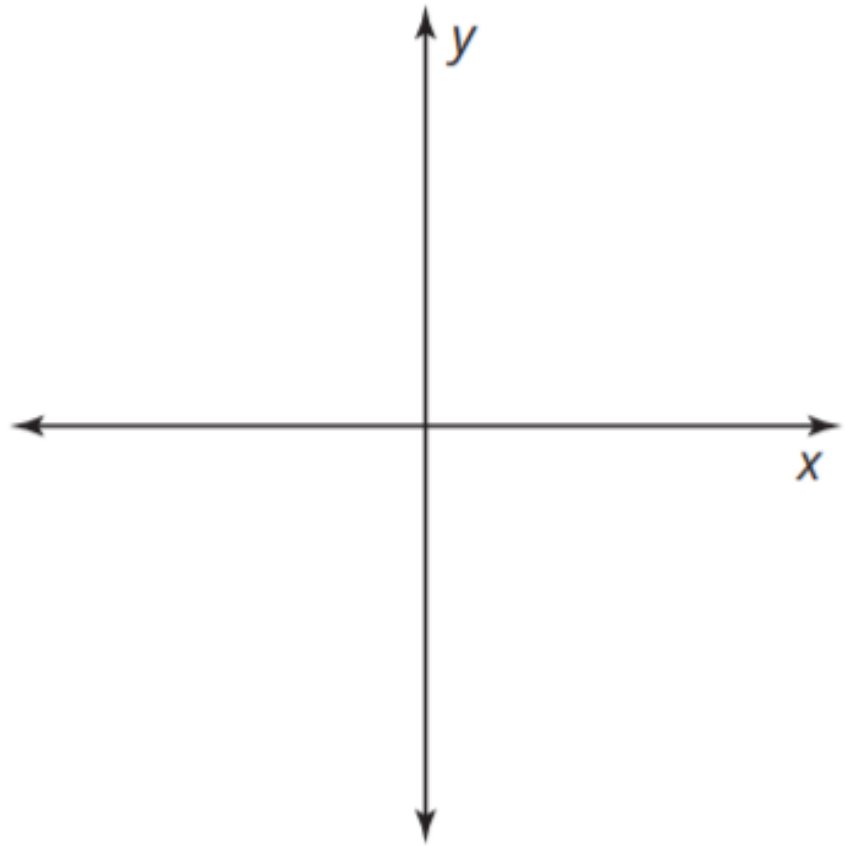
_____

_____

**b. Use the factors to identify the zeros of $f(x) = x^3 + 3x^2 - x - 3$ and then sketch the graph.**



**5. Use factor by grouping to factor and identify the zeros of $f(x) = x^3 + 7x^2 - 4x - 28$. Then sketch the polynomial.**



**6. Braxton and Kenny both factor the polynomial expression $x^3 + 2x^2 + 4x + 8$. Analyze the set of factors in each student's work. Describe the set of numbers over which each student factored.**

**Braxton**

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

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

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

**Kenny**

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

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

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

$(x + 2i)(x - 2i)(x + 2)$

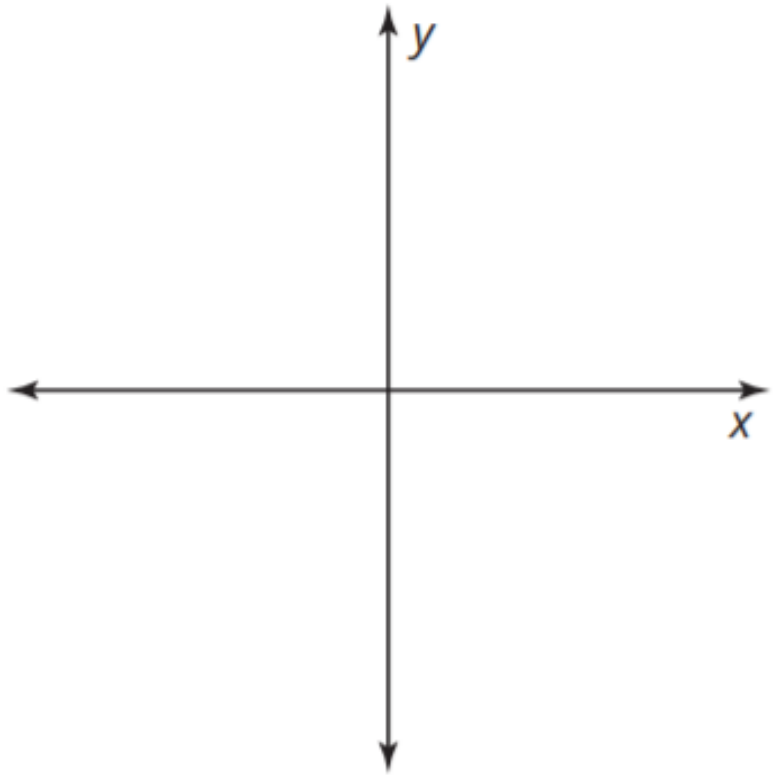
## Worked Example

Factor $x^4 - 29x^2 + 100$ using quadratic form.

| | |
|---|---|
| $x^4 - 29x^2 + 100$ | Determine whether you can factor the given trinomial into 2 factors. |
| $(x^2 - 4)(x^2 - 25)$ | Determine whether you can continue to factor each binomial. |
| $(x - 2)(x + 2)(x - 5)(x + 5)$ | |

**7. Factor each polynomial over the set of complex numbers. Use the factors to identify the zeros and then sketch the polynomial.**

**a.** $f(x) = x^4 - 4x^3 - x^2 + 4x$




**b.** $f(x) = x^4 - 10x^2 + 9$