Module 7
Factoring Trinomials
Things to Know

- When factoring trinomials, our goal is to find the two binomials whose product is the given trinomial.
- Always remove any common factors first.
- There are two ways to factor trinomials: trial and error and grouping.
- Trial & error – find factors of the first term and factors of the last term that when arranged appropriately give you the original trinomial.
- Grouping – find factors of $a \cdot c$ whose sum is the middle coefficient $b$. Replace the middle term with a combination of these factors and then factor by grouping.
Factoring a quadratic with leading coefficient 1 (6.2, Obj. 1)

Factor.

\[ z^2 - 7z + 10 = (z - 2)(z - 5) \]

Check:

\[ z^2 - 5z - 2z + 10 = z^2 - 7z + 10 \]
Factoring a perfect square trinomial (6.3, Obj. 3)

Factor.

\[ 49u^2 - 42u + 9 = (7u - 3)^2 \]

\[ 49u^2 = (7u)^2 \]
\[ 9 = (3)^2 \]
\[ 42u = 2(7u)(3) \]
\[ = 42u \]

\[ (a+b)^2 = a^2 + 2ab + b^2 \]
\[ (a-b)^2 = a^2 - 2ab + b^2 \]
Factoring a quadratic with leading coefficient greater than 1 (6.2, Obj. 1 & 2)

Factor.

\[3z^2 + 22z + 24\]

\[3 \cdot 24 = \frac{72}{1 \frac{72}{12}}\]

\[2 \frac{36}{8}, \frac{18}{9}\]

Grouping \(\Rightarrow\) reverse FOIL

\[\Rightarrow 4\ \text{terms}\]

\[3z^2 + 4z + 18z + 24\]

\[z(3z+4) + 6(3z+4)\]

\[(3z+4)(z+6)\]
Factoring a product of a quadratic trinomial and a monomial

Factor completely.

\[ 6x^5 - 33x^4 - 18x^3 \]

\[ 3x^3(2x^2 - 11x - 6) \]

\[ 3x^3 \left[ 2x^2 + x - 12x - 6 \right] \]

\[ 3x^3 \left[ x(2x+1) - 6(2x+1) \right] \]

\[ 3x^3(2x+1)(x-6) \]