Purpose: In this problem set, you will be practicing factoring polynomials. In particular, you will factor trinomials with leading coefficient not equal to one and a few special cubic polynomials.

Method: Guess and Check

For trinomials with leading coefficient not equal to one, one or both of the linear factors will have leading coefficient that is not one. So, we will "guess and check" using some wise choices for the factors and see what happens.

Factor each of the trinomials below.

1. $5h^2 - 2h - 7$

2. $2x^2 - 5x - 3$

3. This is the same trinomial as the previous one but we will try it together a different way: $2x^2 - 5x - 3$

4. Try this one like the previous one: $6x^2 + 19x + 10$

Method: The quadratic formula:

Given a quadratic function $f(x) = ax^2 + bx + c$, the two zeros/locations of x-intercepts are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This formula ALWAYS works but seems really mysterious. Let's work an example to see how it works.

Find the zeros of the following quadratic functions.

1. $f(x) = x^2 + 6x + 1$

2. $f(x) = 3x^2 + 2x - 1$

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

Method: Sums and Differences of Cubes

Simplify the following products of polynomials:

1. $(x+y)(x^2-xy+y^2)$

2. $(x-y)(x^2+xy+y^2)$

Your computations above give us the following formulas for the sums and difference of cubes:

$$x^3+y^3=$$

$$x^3-y^3=$$

Factor the following polynomials completely:

1. $g(x)=27x^3+64$

2. $h(x)=x^6-5^6$