MATH 162: Calculus II
Framework for Mon., Feb. 5
Integrals using Partial Fraction Expansion

Definition: A *rational function* is a function that is the ratio of polynomials.

Examples: $\dfrac{2x}{x^2+6}$ $\qquad$ $\dfrac{x^2-1}{(x^2+3x+1)(x-2)^2}$ $\qquad$ $\dfrac{1}{\sqrt{x+7}}$

Definition: A quadratic (2nd-degree) polynomial function with real coefficients is said to be *irreducible* (over the reals) if it has no real roots.

A quadratic polynomial is reducible if and only if it may be written as the product of linear (1st-degree polynomial) factors with real coefficients

Examples:

$x^2 + 4x + 3$

$x^2 + 4x + 5$

Partial fraction expansion

- Reverses process of "combining rational fns. into one"
  - Input: a rational fn. Output: simpler rational fns. that sum to input fn.
  - degree of numerator in input fn. must be less than or equal to degree of denominator (You may have to use long division to make this so.)
  - denominator of input fn. must be factored completely (i.e., into linear and quadratic polynomials)
- Why a "technique of integration"?
- leaves you with integrals that you must be able to evaluate by other means. Some examples:

$$\int \frac{5}{2(x-5)}\,dx \qquad \int \frac{2}{(3x+1)^3}\,dx \qquad \int \frac{x+1}{(x^2+4)^2}\,dx$$