In MATH225 you will need to use algebra, trigonometry, and calculus as tools to solve ordinary differential equations. Based on prerequisites, it is expected that you are skilled in these areas of the mathematics already. Small arithmetic, and calculus errors may be graded more intensely than what you may have been accustomed to in your previous math classes. This paper is intended to help review these topics but it should NOT be viewed as an all-encompassing review. For example, you need to be able to add, factor polynomials, integrate, etc. If you have not committed to memory the following then now would be an excellent time to do so:

Quadratic Formula: If $ar^2 + br + c = 0$ then $r = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Complex Numbers:

$\sqrt{-1} = i,\ \ i^2 = -1$, See *Calculus* by Stewart, Appendix I: Complex Numbers for more information

Exponential Properties:

$$a^{b+c} = a^b a^c,\ \ a^{b-c} = \frac{a^b}{a^c},\ \ e^0 = 1,\ \ (a^b)^c = a^{bc},\ \ a^{-b} = \frac{1}{a^b}$$

Note: That a, b, & c can be any real numbers including e

Natural Log Properties:

$$Ln(1) = 0,\ \ Ln(x) - Ln(y) = Ln\left(\frac{x}{y}\right),\ \ Ln(x) + Ln(y) = Ln(xy),\ \ e^{Ln(x)} = x.\ \ aLn(b) = Ln(b^a), b > 0$$

U substitution:

Ex. $\int xe^{x^2} dx \Rightarrow u = x^2, du = 2xdx \Rightarrow \int \frac{1}{2} e^u du = \frac{1}{2} e^{x^2} + C$

Integration by Parts: $\int u\ \ dv = uv - \int v\ \ du$

Ex. $\int te^t dt \Rightarrow u = t, dv = e^t dt, du = dt, v = e^t \Rightarrow te^t - \int e^t dt = te^t - e^t + C$

Partial Fraction Decomposition:

Take the form of

$$\frac{A}{(ax+b)^n} \quad or \quad \frac{Ax + B}{\left(ax^2 + bx + c\right)^n}$$

Examples

a. $\dfrac{s^2 + s + 4}{s(s-1)(s+2)} = \dfrac{A}{s} + \dfrac{B}{s-1} + \dfrac{C}{s+2}$

b. $\dfrac{s^2 + s + 4}{s(s-1)(s+2)^2} = \dfrac{A}{s} + \dfrac{B}{s-1} + \dfrac{C}{s+2} + \dfrac{D}{(s+2)^2}$

c. $\dfrac{s^2 + s + 4}{s(s-1)(s^2+2)} = \dfrac{A}{s} + \dfrac{B}{s-1} + \dfrac{Cs + D}{s^2 + 2}$

Completing the Square: $x^2 - 2x + 5 = x^2 - 2x + \left(\frac{2}{2}\right)^2 + 5 - \left(\frac{2}{2}\right)^2 = (x-1)^2 + 4$

The Greek Alphabet

In this course the textbook frequently uses Greek letters to signify variables. The table below is designed to help you with the notation in this class.

Upper Case	Lower Case	Name
Α	α	Alpha
Β	β	Beta
Χ	χ	Chi
Δ	δ	Delta
Ε	ε	Epsilon
Φ	ϕ,φ	Phi
Γ	γ	Gamma
Η	η	Eta
Ι	ι	Iota
Κ	κ	Kappa
Λ	λ	Lambda
Μ	μ	Mu
Ν	ν	Nu
Ο	o	Omicron
Π	π	Pi
Θ	θ	Theta
Ρ	ρ	Rho
Σ	σ	Sigma
Τ	τ	Tau
Υ	υ	Upsilon
Ω	ω	Omega
Ξ	ξ	Xi
Ψ	ψ	Psi
Ζ	ζ	Zeta