Must Know Material for Mini-test#1 - M151 - Calculus II - Spring 2021

This sheet contains a list of the material that MUST be second nature to you in preparation for Mini-test#1. In addition to studying the following Calc-II material that will be included in Mini-test#1:

- Sec. 3.11 Hyperbolic Functions
- Sec. 6.1: Areas Between Curves
- Sec. 6.2: Volumes (by slices, disks and washers)
- Sec. 6.3: Volumes by Cylindrical Shells
- Sec. 6.4: Work
- Sec. 6.5: Average Value of a Function
- Sec. 7.1: Integration by Parts
- Sec. 7.2: Trigonometric Integrals
- Sec. 7.3: Trigonometric Substitution
- Sec. 7.4: Integration of Rational Functions by Partial Fractions

You must also be very confident with ALL the material from Calc-I. You can have a look at the following review material from Calc-I:

- [Derivatives] [Practice problems with solutions]
- [Integrals] [Practice problems with solutions]

In addition to studying ALL Calc-I and Calc-II material above, you must be very confident with the following basic and fundamental topics/formulas/techniques/etc.:

- Quadratic formula, factorizing a quadratic, completing a square, plotting, min/max, vertex, roots.
- Being able to quickly sketch (i.e. without tabulating) all basic functions: lines, parabolas, logarithms, exponentials, trigonometric, and polynomials (using only their roots and their limits at $\pm\infty$).
- Review how to obtain new curves from old curves: horizontal translation $[y = f(x - a)]$ and vertical translation $[y = f(x) + A]$. Rescaling in the X-axis $[y = f(x/b)]$ and rescaling in the Y-axis $[y = B \cdot f(x)]$.
- u-sub
- Trigonometric functions:
  - Definition (trig circle, sin, cos, ..., adjacent, opposite, ...)
  - Basic trig identities/formulas
  - Derivatives, integrals
  - Values for main/important angles
- Laws of exponents and logarithms
- Equation for line, point-slope formula, equation from two points, ...
- Equation for circle of radius R centered at (x_0, y_0)
- Hyperbolic functions (definition in terms of exp, derivatives, integrals)
- Being able to find integrals for volumes (disk/washer and cylindrical shells) when rotating a region about an axis parallel to the X and Y-axis. For instance and axis $x = 2$ or $y = -3$, etc..
- Useful summary for trig. subs: `http://carretero.sdsu.edu/teaching/M-151/lectures/M151_trig_subs_summary.pdf`
- Completing squares [for integration using partial fractions and trig subs]
- Long-division (how to divide polynomials) [for integration using partial fractions]

Also, I have seen way too many algebraic/conceptual mistakes in past midterms. I want to give you an idea of the issues that I have seen so that you NEVER make mistakes like these:

- Remember the notation $\exp(x) = e^x$.
- $f'(x)$ is NOT equal to $f^{-1}(x)$, the former is the derivative while the later is the inverse.
- $a^2 + b^2$ is NOT $(a + b)^2$ (particularly important when you do washers where you have $r^2_{\text{outer}} - r^2_{\text{inner}}$).
- $\sqrt{a^2 + b^2}$ is NOT $a + b$
- $\sin(3x)/3$ is NOT $\sin(x)$. In general: $f(b\,x)/b$ is NOT $f(x)$.
- $e^{a\,\ln(x)}$ is NOT $a\,x$ but $e^{a\,\ln(x)} = e^{\ln(x^a)} = x^a$.