
APPM 2450 Calculus 3 Computer Lab
Lab Exercise: Multiple Integrals and Coordinate Systems

Create a Mathematica notebook that does all of the following. Feel free to ask your neighbor or your lab instructor for help if you get stuck.

- Integrate $\sin(x)$ from $x = 0$ to $x = \pi$.
- Use `NIntegrate` to perform the same integral.
- Perform $\int_{-\infty}^{\infty} e^{\tau x^2} dx$.
- Specify $\tau < 0$ and perform the integral again.
- Perform $\int_0^{\frac{\pi}{2}} \int_0^y \cos(x) \sin(y) dx dy$.
- Perform $\int_{-1}^1 \int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} \log(x^2 + y^2 + 1) dx dy$.
- Did *Mathematica* have problems with this integral?
- Try moving the integral to polar coordinates.
- Use `NIntegrate` to perform the same integral.
- Plot the integrand using `CylindricalPlot3D`.
- Use `SphericalPlot3D` to plot $\cos(\theta) \sin(\phi)$ for $0 \leq \theta \leq 2\pi$ and $0 \leq \phi \leq \pi$.
- Find the center of mass of a thin triangular plate bounded by the y axis, and the lines $y = x$ and $y = 2 - x$ if the density function is $\delta(x, y) = 6x + 3y + 3$.