

APPM 2450 Calculus 3 Computer Lab
Lab Exercise 1

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. Items with a \blacktriangleright are required, items with a \star are optional.

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- \blacktriangleright What is e to 5 decimal places? What is π to 30 decimal places? What is $\sin(1)$ to 10 decimal places (remember to use square brackets and a capital 'S').
 - \blacktriangleright Define the function $f(x) = a * x^2 + b * x + c$. Remember, when defining functions to use an underscore after the x on the left hand side, but not the right hand side.
 - \blacktriangleright Evaluate $f(0)$, $f(1)$, $f(-1)$.
 - \blacktriangleright Now, insert a *text cell* at the very top of the notebook. Type in your name (Format, style, text in the menu.)
 - \blacktriangleright Define $x1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$, remember to use a $*$ and parenthesis when needed.
 - \blacktriangleright Type `f[x1]`. What does Mathematica return? What should it return? Use `Simplify` to get a better answer.
 - \blacktriangleright Define $a = 1$, $b = -1$, and $c = -6$.
 - \blacktriangleright What is $f(x)$ now?
 - \blacktriangleright Get help for the command `Factor`.
 - \blacktriangleright Use the command `Factor` to factor $f(x)$.
 - \blacktriangleright Clear the values of a , b , and c , *do not* restart the kernel or use `Quit`.
 - \blacktriangleright Define the vectors $\mathbf{u} = 2\mathbf{i} + 7\mathbf{j} + \mathbf{k}$, $\mathbf{v} = 3\mathbf{i} + \mathbf{j} + 4\mathbf{k}$.
 - \blacktriangleright Calculate $\mathbf{u} \cdot \mathbf{v}$, $|\mathbf{u}|$, and $|\mathbf{v}|$.
 - \star Use the relationship $\mathbf{A} \cdot \mathbf{B} = |\mathbf{A}||\mathbf{B}| \cos(\theta)$, where θ is the angle between the vectors \mathbf{A} and \mathbf{B} to calculate the angle between \mathbf{u} and \mathbf{v} . Note that in Mathematica to calculate $\cos(x)^{-1}$ you should use `ArcCos[x]`.
 - \star Define the function $g(x) = x^3 - 3x^2 - x + 3$.
 - \star Factor $g(x)$.
 - \star Define $h(x) = 1/g(x)$ with the command `h[x_]=1/g[x]`
 - \star Use `Apart` to find the partial fraction decomposition of $h(x)$.
 - \blacktriangleright Go to 'Kernel', then 'Delete All Output'. Save your notebook as *YourLastName1.nb* and email as an attachment to your instructor.