NOTE: Each exercise is worth 10 points and can be turned in at any time before its “expiration date”. At the end of the semester, I will expect you to have turned in at least 2/5 of the exercises assigned. If you do more, I will pick your best grades. If you do less, the missing grades will be counted as zeros. Altogether, these will count the same as one project.

1. \((\text{expires 2/11})\) Use Maple to write \(x^5 - 2x^4 - 10x^3 + 20x^2 - 16x + 32\) as a product of exact linear factors. By exact, I mean you should leave any non-rational factors expressed as radicals; do not approximate terms like \(\sqrt{3}\) as 1.73205, etc.

2. \((\text{expires 2/11})\) Draw a graph showing both \(\cos(x)\) and its fifth Taylor polynomial (that is, \(1 - \frac{1}{2!}x^2 + \frac{1}{4!}x^4\)) for \(x\) between -4 and 4. What degree of Taylor polynomial seems to be needed to get good agreement in this range? Hint: use a variation of the command \(\text{convert(taylor(cos(x),x,5),polynom)}\) to make this work. Think of a suitable way to demonstrate that the approximation you have taken is “good” – what is a good definition of “good” here?

3. \((\text{expires 2/18})\) Consider the planar curve \(\gamma\) defined by \(x^2y^3 + y^2 + y - 2e^x = 0\). Using only Maple, find the slope of the tangent line to the curve at \((0,1)\). Then plot the curve and the tangent line on the same graph. Hint: you might want to use \text{implicitplot} from the library \text{plots}. You might find \text{implicitdiff} helpful, too.

4. \((\text{expires 2/18})\) Plot the function \(f(x) = 2\sin x - x^3 - 1/5\), for \(x \in [-4,4]\). Find all the zeros of the function with an accuracy of 20 decimal digits. Hint: See \text{Digits}, \text{fsolve}.

5. \((\text{expires 2/18})\) Define a Maple function \(g\) that, given a positive integer \(k\) yields the sum of the first \(k\) primes. What is \(k\) such that \(g(k) \leq 100,000\) but \(g(k+1) > 100,000\)? You might find \text{sum} and \text{ithprime} helpful.

6. \((\text{expires 2/18})\) Use the Taylor expansion of \(\arctan x\) near the point \(x = 1/\sqrt{3}\) to compute the value of \(\pi\) to 30 places. How many terms are needed to compute the value to 50 places?