

1. PROBLEMS TO BE PRESENTED ON 10-25

If you are interested in doing a problem, but would like some help, email me for hints.

- First problem for presentation: In statistics and engineering it is useful to talk about the “error function”, which is defined by the formula

$$\operatorname{erf}(x) := \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt$$

If you try to integrate e^{-x^2} , you’ll find that you can’t express it in terms of “elementary functions” — meaning that you can’t write out in terms of powers, sums, products and compositions of $x, e^x, \sin x, \ln x, 1$, etc. In other words, there is no short formula to write the error function. Find a power series that converges to the error function.

- Second Problem for Presentation: Find a Taylor series expansion for $\sqrt{1+x}$.
- Third problem for presentation (challenge): Let $f(x) = e^{-1/x}$. Show that the n th derivative $f^{(n)}(0) = 0$ for all n . Explain why this means that you cannot approximate this function with a Taylor series.