

Instructions (read these carefully!):

- This assignment must be submitted on Gradescope by the due date. Gradescope entry code: PRXD46
- Please **include a title page** with your name and the names of your collaborators.
- Homework is graded anonymously, so please avoid putting your name on each page of the assignment.
- If you are stuck, please ask for help (from me, Sarah, a classmate, ...). Use Ed discussions! AI use is generally **not** recommended for completing the homework.
- You may freely use any fact proved in class (mention it in the appropriate spot). You *may not* freely use facts from the book or other sources.
- As a general rule, try to restrict your solution to each problem to a single page. Often solutions can be short, while still being complete. If your solution is very long, you should think more about how you might express it more concisely.

HW2: complex differentiability, square roots, Cauchy–Riemann equations

Due: Friday, Sept 25 by 5pm

1. Use the triangle inequality to prove the reverse triangle inequality $||z| - |w|| \leq |z - w|$. Picture this geometrically.
2. Prove: if f is differentiable at z_0 and $f'(z_0) = 0$, then $g(z) = |f(z)|$ is differentiable at z_0 .
3. True or false: if $f = u + iv$ and u, v are continuously differentiable and $u_x = v_y$ and $u_y = -v_x$ at (x_0, y_0) , then f is differentiable at $x_0 + iy_0$.
4. Find all the points at which $f(z) = |z|$ is complex differentiable.
5. True or false: the set of points where $f : \mathbb{C} \rightarrow \mathbb{C}$ is differentiable is an open set.
6. Solve: $z^4 - 6z^2 + 25 = 0$.