Homework:

1. Prove that if $f$ is analytic in a domain $D$ and $f'(z) = 0$ in $D$ then $f$ is constant.

2. Prove that if $f$ is analytic in a domain $D$ such that $f(z)$ is always real, then $f$ is constant.

3. Are the following functions differentiable?
   a) $f(z) = -2(xy + x) + i(x^2 - 2y - y^2)$
   b) $f(z) = \frac{y + ix}{x^2 + y^2}$ ($z \neq 0$)

4. Let $f(z) = |z|^2$. Show that $f$ is differentiable only at $0$.

5. Show that $f(z) = x^2y^2 + i2xy$ is differentiable only on $x$-axis.