Panel 1

## HW - Complex Analysis

① Find the natural domain of (a) $f(z)=\frac{z}{z+\bar{z}}$, (b) $g(z)=\frac{1}{1-z\bar{z}}$
Describe your answer in geometric terms or draw it.

② Every complex function $f(z)=u(x,y)+iv(x,y)$. Find $u(x,y)$ and $v(x,y)$ for $f(z)=z^3+z+1$

③ Suppose $f(z)=x^2-y^2-2y+i(2x-2xy)$. Rewrite the function in terms of $z$ and $\bar{z}$, where $x=\frac{z+\bar{z}}{2}$ and $y=\frac{z-\bar{z}}{2i}$

④ Let $f(z)=x^2-y^2+2ixy$. Rewrite in terms of $z$ and $\bar{z}$.

⑤ Show that $f(z)$ can also be written as $f(z)=u(r,\theta)+iv(r,\theta)$.
Find $u(r,\theta)$ and $v(r,\theta)$ for $f(z)=z^2$.

⑥ Rewrite $f(z)=z+\frac{1}{z}$ as $u(r,\theta)+iv(r,\theta)$

Panel 2

④ Visit http://www.mathcs.org/java/programs/ZM and read "Math Background" and "zMap Quick Guide"

⑤ Answer the first question of the "zMap Sample Questions"