Homework Set # 3

- 1. **Page 44** : # 1(a)(b) .
- 2. Rewrite these complex functions as functions of z and/or \overline{z} :

(a)
$$G = y + ix$$
 (b) $F = x^2 + \frac{2y}{(x^2 + y^2)^{3/2}} - 4ix + 1$.

3. Sketch the vector fields associated with these complex functions :

(a)
$$g(z) = -\frac{i z}{|z|}$$
 (b) $f(z) = \frac{2 i}{z}$.

- 4. **Page 45** : # 10(a)(b) .
- 5. A uniformly charged infinite rod, standing perpendicular to the complex plane C at z_0 , generates an electric field at every point in the plane. The intensity of this field at a point z varies inversely as the distance from z_0 to z and is directly along a line from z_0 to z (see diagram below). Thus, if the rod has charge q (at z_0) then the field is given by

$$F(z) = \overline{\left(\frac{2\,q}{z-z_0}\right)} \qquad (\text{cf } \#13, \text{ page } 45).$$

Using this fact, find the *equilibrium points* for the electric field generated by three such rods: first rod is at \mathbf{i} with charge +1, the second rod at $\mathbf{1}$ with charge +1, and the third rod at $\mathbf{0}$ with charge +3.

