Justify your answers.

1. What are all the the conformal mapping from the disc $D(0, 1)$ to the disc $D(0, r), r > 1$.

2. Compute the integral
   $$\int_0^\infty \frac{1}{x^3 + x + 1} dx.$$

3. Prove that two circular annuli are conformally equivalent (there exists a conformal map from one into the other) if and only if the ratios of their radii are equal.

4. Suppose $f$ is $C^2$ and subharmonic on the unit disc. Define
   $$F(r) = \int_0^{2\pi} f(re^{i\theta}) d\theta.$$ 
   Prove that $F$ is nondecreasing function of $r$.

5. If $f$ is analytic in the upper half plane $\{Im(z) > 0\}$ and bounded by $M$. Find a bound on $\sup f^{(n)}$ in the half plane $\{Im(z) > r\}$ for $r > 0$. 
