1. Show that $\delta(x) g(x) = \delta(x) g(0)$. [Consider the result of integrating each against an arbitrary well-behaved function $f(x)$.

2. Given that $\nabla^2 \frac{1}{r} = -4\pi \delta^{(3)}(r)$,

   (a) Show that $(\nabla^2 + k^2) \frac{e^{ikr}}{r} = -4\pi \delta^{(3)}(r)$.

   (b) Show that $\psi(r) = \int d^3 x' \frac{e^{ik|r-r'|}}{|r-r'|} j(r')$ is a solution to $(\nabla^2 + k^2) \psi(r) = -4\pi j(r)$.

3. Is $(i)^i$ real, imaginary, or complex? Is $(i^i)$ real, imaginary, or complex?

4. Find all $z$ such that $\cos z = i$.

5. Compute $\int_0^{2\pi} \frac{d\theta}{1 + \sin\alpha \sin\theta}$.