Physics 751 Homework #6

Due Friday October 10

1. Evaluate the integral \[
\int_{-\infty}^{\infty} \frac{dx}{x^2 + a^2},
\]
a real, by closing the contour with a large semicircle at infinity—and prove that the semicircle gives a zero contribution.

2. Evaluate the integral \[
\int_{-\infty}^{\infty} \frac{e^{ikx}}{x-x_0+i\epsilon} dx
\]
by closing with a large semicircle at infinity (upper half plane or lower half plane?). Here \(\epsilon\) is a very small real quantity, as usual. Does the value of the integral depend on the sign of \(\epsilon\)? What about the sign of \(k\)? (\(k\) is real.) Explain.

Shankar 5.4.2, 5.4.3.