1. page 70 / 5 (steepest descent) Assume \( n \) is even. What happens if \( n \) is odd?

2. page 78 / 1 (i) (stationary phase) Find the leading order term in the expansion.

3. page 78 / 2 (Fresnel integral, stationary phase/steepest descent)

4. page 79 / 3 (a higher order point of stationary phase)

5. Let \( f(x) = (x^4 + 1)^{-1/2} \). Find the first term in the asymptotic expansion of the Fourier transform \( \hat{f}(k) \) as \( k \to \infty \). Use the definition \( \hat{f}(k) = \int_{-\infty}^{\infty} f(x)e^{ikx}dx \).

6. page 98 / 2 : inverse Fourier transform, use the definition \( f(t) = \int_{-\infty}^{\infty} e^{itz}(z^2 - 1)^{-1}dz \)

7. page 98 / 4 (i) : inverse Laplace transform

8. The dispersion relation for elementary water waves of the form \( \phi(x,t) = a \cos(kx - \omega t) \) on a body of water of uniform depth is given by

\[
\omega^2 = gk \tanh kd,
\]

where \( \omega \) is the frequency, \( k \) is the wavenumber, \( g \) is the acceleration due to gravity, and \( d \) is the water depth. The limit \( kd \to 0 \) is called shallow water, and the limit \( kd \to \infty \) is called deep water. Fill in the blanks in the following statements. Justify your answers.

a) In _________ water, the wave speed is independent of the wavelength.

b) In _________ water, long waves travel faster than short waves.