

Physics 451- Fall 2012

Homework #10

Extended Friday, Oct 5, by 7pm

Please place your assignment in the “Physics 451” slot across from N373 ESC.
We have help sessions twice a week, in N337 ESC (undergraduate lab):

T Th from 3 to 6 pm

List of problems (from the textbook):

2.33

2.34

2.35

Hints:

For problem 2.33, study the three cases $E < V_0$, $E = V_0$, and $E > V_0$ separately.

For each case, divide the space in three regions and use the continuity at boundaries at $-a$ and at $+a$. Since we are studying scattering states here ($E > 0$), assume that your solution is a wave coming from the left in the first region ($x < -a$), and keep only the transmitted term (wave travelling in the positive x direction) in the third region ($x > a$).

Useful formulae

$$\sin x = \frac{e^{ix} - e^{-ix}}{2i}; \cos x = \frac{e^{ix} + e^{-ix}}{2}; \cos^2 x + \sin^2 x = 1$$

$$\sinh x = \frac{e^x - e^{-x}}{2}; \cosh x = \frac{e^x + e^{-x}}{2}; \cosh^2 x - \sinh^2 x = 1$$

For problem 2.34: For scattering states ($E > V_0$), assume that your solution is a wave coming from the left and keep only the transmitted term in the right region ($x > 0$). For question c) the coefficient of transmission is given by the ratio between the probability current J for the transmitted wave and for the incoming wave.