Physics 201, Fall 2018
Problem Set #4 (due Friday, Oct 5)

Problems from Serway, Moses and Moyer (each problem is 10 points)

2.20, 2.21, 2.23, 2.29, 2.30, 2.31

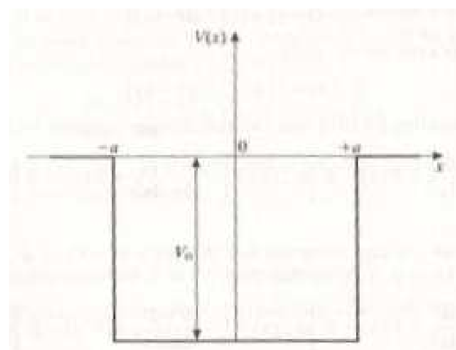
Review problems (each problem is 5 points)

R1. Using Euler's formular $e^{ix} = \cos x + i\sin x$, calculate: $e^{-i\pi}$, $e^{i5\pi/2}$, $e^{-i\pi/2}$, $e^{i\pi/4}$, $e^{-i\pi/6}$.

R2. Same function can be expressed in a form of regular trigonometric functions $\psi(x) = A\cos x + B\sin x$, and in a form of complex exponents $\psi(x) = \alpha e^{ix} + \beta e^{-ix}$. Express coefficients α and β in terms of *A* and *B*.

R3. A classical particle mass *m=0.5kg* with total energy $E_1=-3.0J$, is placed in a potential well shown to the right; i.e., the potential energy is defined as: $U(x) = \begin{cases} -V_0, & |x| < a \\ 0, & |x| \geq a \end{cases}$
Here the depth of the well is $V_0=5.0J$, and its size *a=1.1m*.

a) In what range of x the particle can be found?
b) Sketch the velocity of the particle as a function of position.



R4. Now, the total energy of the same particle is change to be $E_2=2.0J$ (all other parameters stay the same).

a) In what range of x the particle can be found?
b) Sketch the velocity of the particle as a function of position.

Note 1: obviously, the particle is non-relativistic, so it is safe to use $K=mv^2/2$ expression for the kinetic energy. And total energy is the sum of the kinetic and potential energy (without accounting for the rest energy).

Note 2: feel free to plot the velocity graphs on the computer, if it is more convenient.