Quiz 1:

1) For a parabolic energy band structure in 1D, how does the density-of-states in the valence band, DOS(E), vary with energy?
   a) $DOS(E) \propto 1/(E_v - E)^2$
   b) $DOS(E) \propto 1/(E - E_v)^2$
   c) $DOS(E) \propto 1/(E - E_v)$
   d) $DOS(E) \propto 1/(E - E_v)$
   e) $DOS(E) \propto 1/\sqrt{E_v - E}$

2) For a parabolic energy band structure in 2D, how does the density-of-states in the conduction band, DOS(E), vary with energy?
   a) $DOS(E) \propto (E - E_C)^1$
   b) $DOS(E) \propto (E - E_C)^{1/2}$
   c) $DOS(E) \propto (E - E_C)^0$
   d) $DOS(E) \propto (E - E_C)^{-1/2}$
   e) $DOS(E) \propto (E - E_C)^{-1}$

3) For a parabolic energy band structure in 3D, how does the density-of-states in the conduction band, DOS(E), vary with energy?
   a) $DOS(E) \propto (E - E_C)^2$
   b) $DOS(E) \propto (E - E_C)^1$
   c) $DOS(E) \propto (E - E_C)^{1/2}$
   d) $DOS(E) \propto (E - E_C)^0$
   e) $DOS(E) \propto (E - E_C)^{-1/2}$

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Week 4 Quiz 1: (cont.)

4) The “density-of-states” effective mass depends on what?

   a) Another name for the real effective mass (i.e. the band curvature)
   b) A combination of real effective masses
   c) A combination of real effective masses and the valley degeneracy
   d) The real effective mass in units of the rest mass, \( m_0 \).
   e) The relativistic effective mass.

Quiz 2:

1) What is the probability that a state at \( E = E_F \) is occupied?
   a) 0.0
   b) 0.25
   c) 0.50
   d) 1.0
   e) 1.5

2) What is the probability that a state at \( E << E_F \) is occupied?
   a) 0.1
   b) very, very small, but not exactly zero
   c) 0.5
   d) 1.0
   e) very, very close to one but not exactly one.

3) What is the probability that a state at \( E >> E_F \) is occupied?
   a) 0.1
   b) very, very small, but not exactly zero
   c) 0.5
   d) 1.0
   e) very, very close to one but not exactly one.

4) What is the Maxwell-Boltzmann (or non-degenerate) approximation to the Fermi function for \( E >> E_F \)?
   a) \( e^{(E-E_F)/k_B T} \)
   b) \( e^{-E-E_F)/k_B T} \)
   c) \( e^{(E-E_F)/k_B T} + 1 \)
   d) \( e^{(E-E_F)/k_B T} - 1 \)
   e) \( e^{(E-E_F)/k_B T} - 1 \)