The electromagnetic form factor of the pion is calculated in the "point-form" of relativistic quantum mechanics using simple, phenomenological wave functions. It is found that the squared charge radius of the pion is predicted one order of magnitude larger than the experimental value and the asymptotic behavior expected from QCD cannot be reproduced. The origin of these discrepancies is analyzed. The present results confirm previous ones obtained from a theoretical model and call for major improvements in the implementation of the "point-form" approach. The role of essential ingredients for the description of the pion form factor is reminded. 