2. [14 points] Consider the integral $\int_0^2 \frac{(\sin\sqrt{x})+1}{\sqrt{x}}\,dx$.

   (a) [2 points of 14] Explain why this is an improper integral.

   (b) [6 points of 14] Carefully show, using an appropriate comparison function (that is, without actually evaluating the integral), that this integral converges.

   (c) [6 points of 14] Carefully work out the actual value of the integral.