Check your understanding

3. Which of the following shapes is the best approximation to the curve parametrized by $x = (\cos t)^{1/101}$, $y = (\sin t)^{1/101}$, $0 \leq t \leq 2\pi$?

   (a) The square with vertices $(\pm 1, \pm 1)$.

   (b) The square with vertices $(\pm 1, 0)$ and $(0, \pm 1)$.

   (c) The "plus sign" consisting of the line segment from $(-1, 0)$ to $(1, 0)$ and the line segment from $(0, -1)$ to $(0, 1)$.

   Answer: (a)

   Explanation: Eliminating the t variable gives the equation $x^{202} + y^{202} = 1$. This curve is close to the square in (a), roughly because for a point on the square one has $x^{202} + y^{202} \geq 1$; and as one moves towards the origin, $x^{202} + y^{202}$ rapidly decreases, so there is a nearby point where $x^{202} + y^{202} = 1$. Note that the curve $x = (\cos t)^{101}$, $y = (\sin t)^{101}$, $0 \leq t \leq 2\pi$ is close to the "plus sign" in (c).