Episode 18: Medical imaging and Fourier analysis

Puzzle:
If a function is made by adding sin(θ) + cos(θ), what's the maximum value attained by this function?

Answer:
This is a periodic function, which repeats every 180 degrees (or π radians). Its maximum value is the square root of two, or $\sqrt{2} = 1.414213\ldots$, which it first reaches at a value of 45 degrees, or π/4. The function varies between $\sqrt{2}$ and $-\sqrt{2}$, and it looks like a sin curve.

The function can also be written as $\sqrt{2} + \sin(\theta + \pi/4)$. For a graph of the function, and more detail, input it into Wolfram Alpha.