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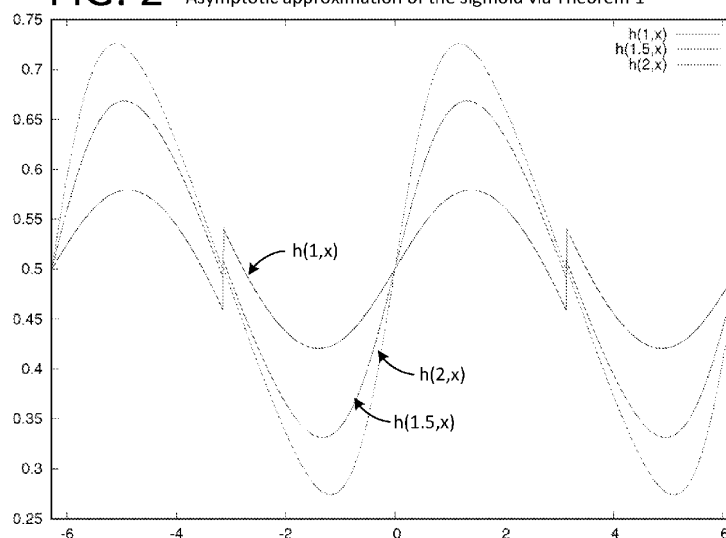


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(54) **Title:** HIGH-PRECISION PRIVACY-PRESERVING REAL-VALUED FUNCTION EVALUATION

FIG. 2 Asymptotic approximation of the sigmoid via Theorem 1



(57) **Abstract:** A method for performing privacy-preserving or secure multi-party computations enables multiple parties to collaborate to produce a shared result while preserving the privacy of input data contributed by individual parties. The method can produce a result with a specified high degree of precision or accuracy in relation to an exactly accurate plaintext (non-privacy-preserving) computation of the result, without unduly burdensome amounts of inter-party communication. The multi-party computations can include a Fourier series approximation of a continuous function or an approximation of a continuous function using trigonometric polynomials, for example, in training a machine learning classifier using secret shared input data. The multi-party computations can include a secret share reduction that transforms an instance of computed secret shared data stored in floating-point representation into an equivalent, equivalently precise, and equivalently secure instance of computed secret shared data having a reduced memory storage requirement.

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