

CE 311K: Taylor series

Krishna Kumar

University of Texas at Austin

krishnak@utexas.edu

November 3, 2019

1 Catenary vs Parabola

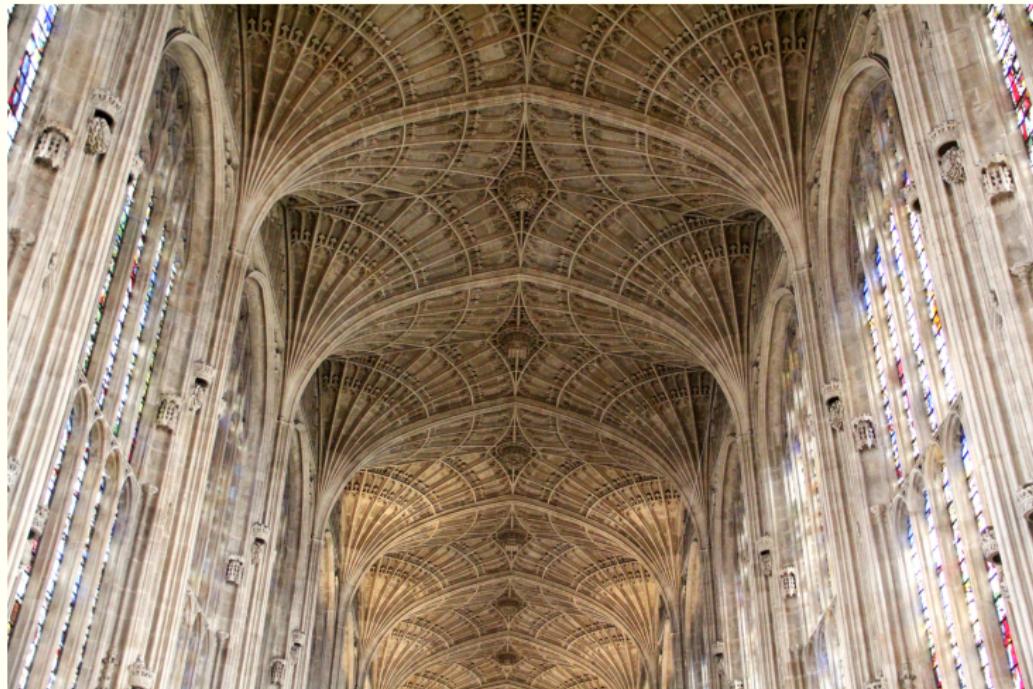
2 Taylor series

3 Newton Raphson

The fan vaults of King's college



② What is the thickness of the ceiling?



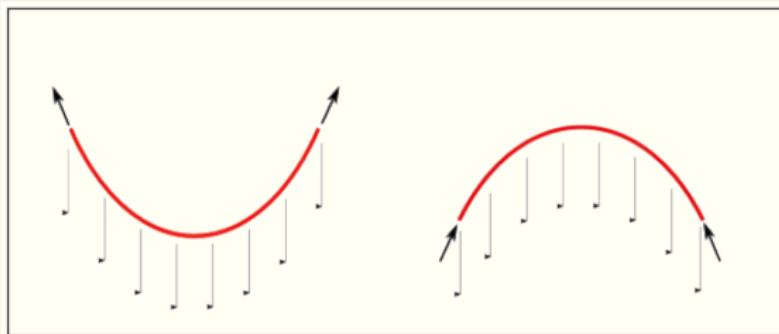
From arches to fan vaults



The fan vaults of King's college



Catenary



A [catenary curve](#) (left) and a catenary arch, also a catenary curve (right). One points up, and one points down, but the curves are the same.

Sagrada Familia



catenary design



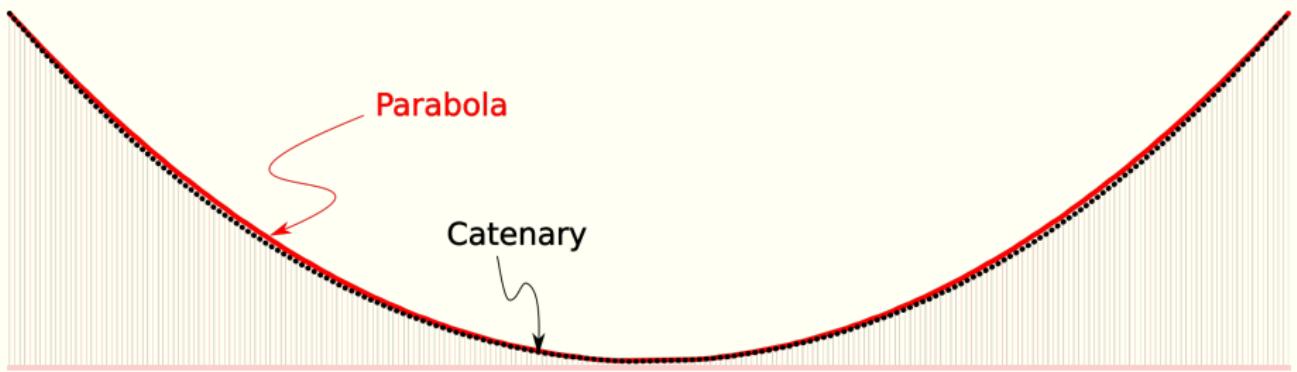
Catenary, catenary . . . everywhere



② What is this shape?

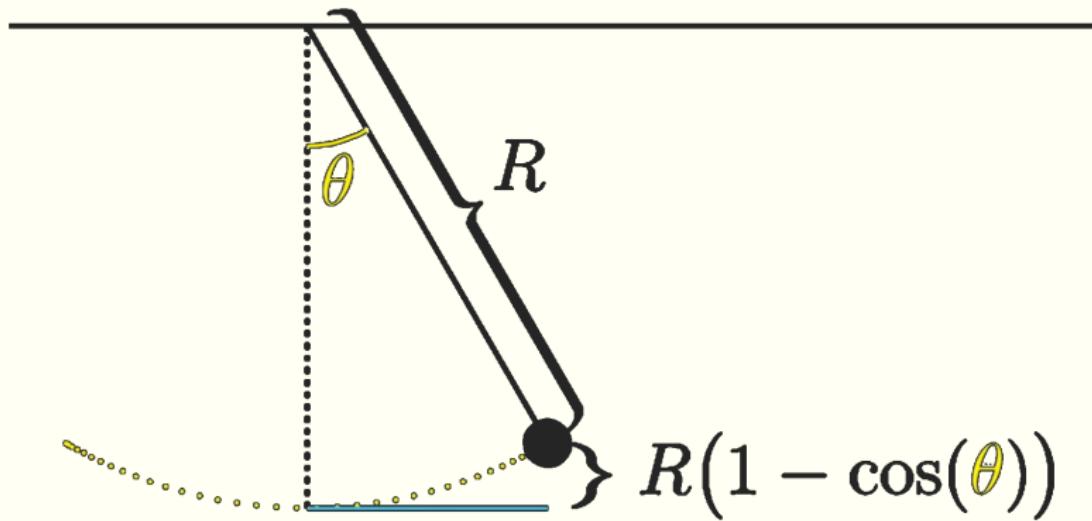


Catenary vs Parabola



Potential energy of a simple pendulum

We need to know how high the weight of the pendulum is above its lowest point



1 Catenary vs Parabola

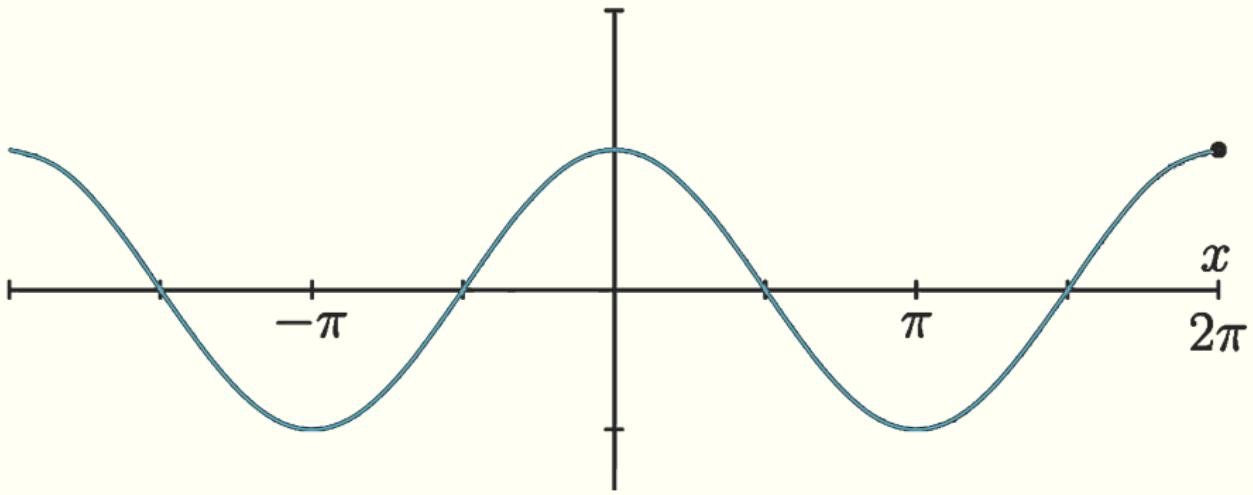
2 Taylor series

3 Newton Raphson

Taylor series

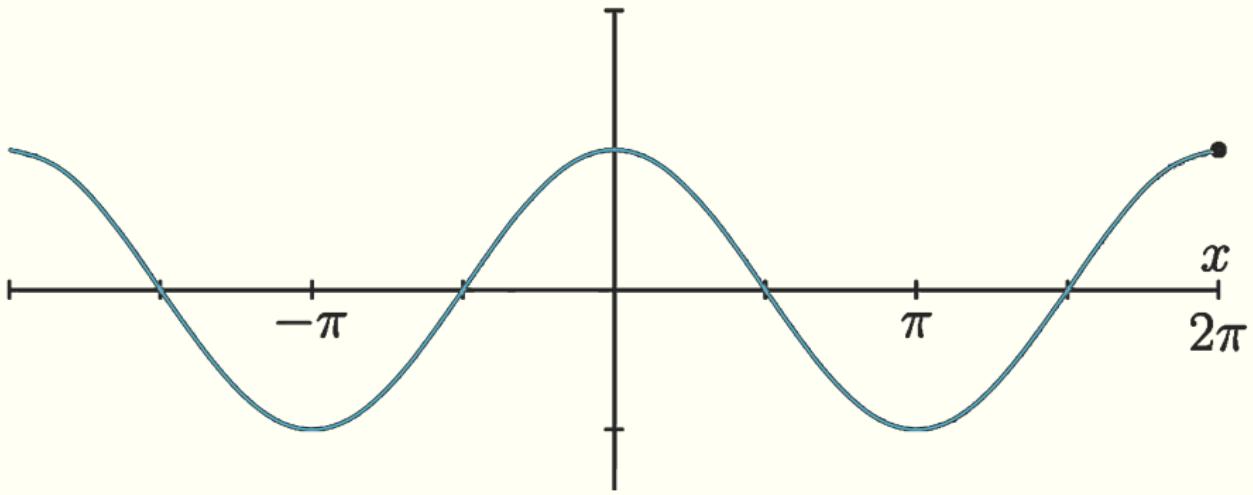
Taylor series of $\cos(x)$

$\cos(x)$



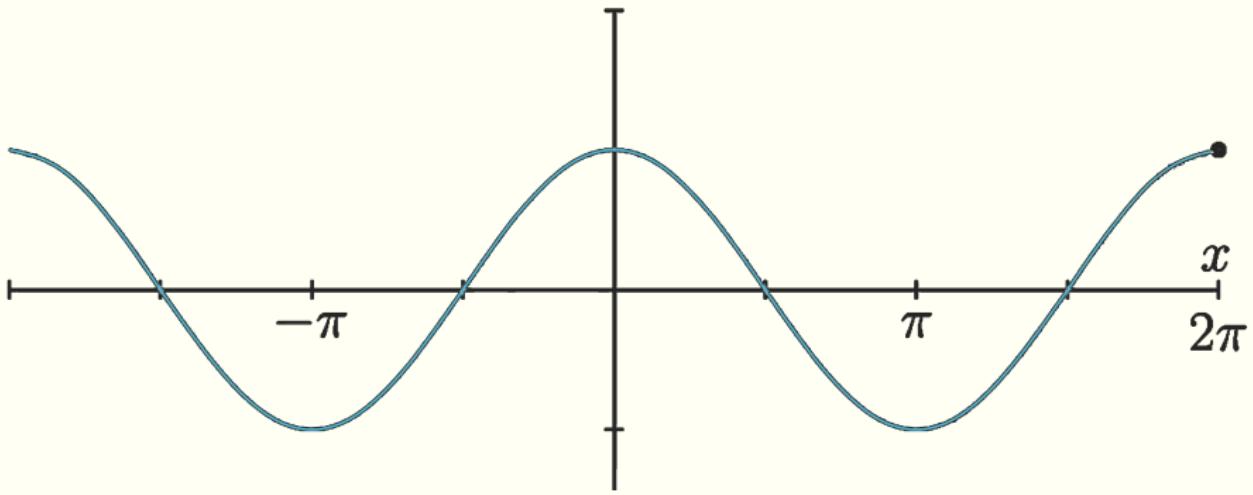
Taylor series of $\cos(x)$

$\cos(x)$



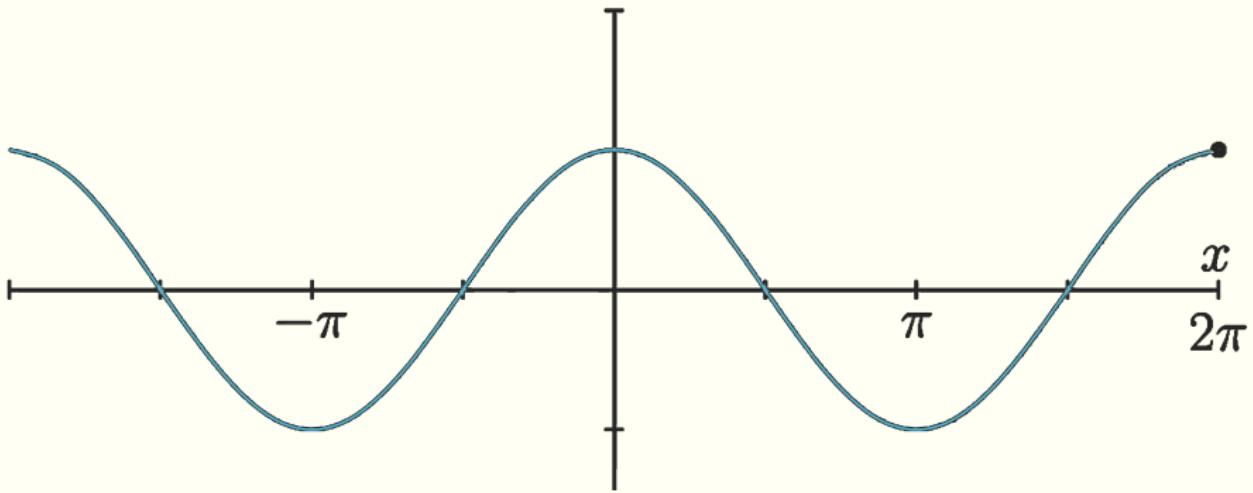
Taylor series of $\cos(x)$

$\cos(x)$



Taylor series of $\cos(x)$: 4th derivative

$\cos(x)$



Taylor series of cos(x)

Taylor series: Generalization

Taylor series: Generalization

Taylor series: Generalization

1 Catenary vs Parabola

2 Taylor series

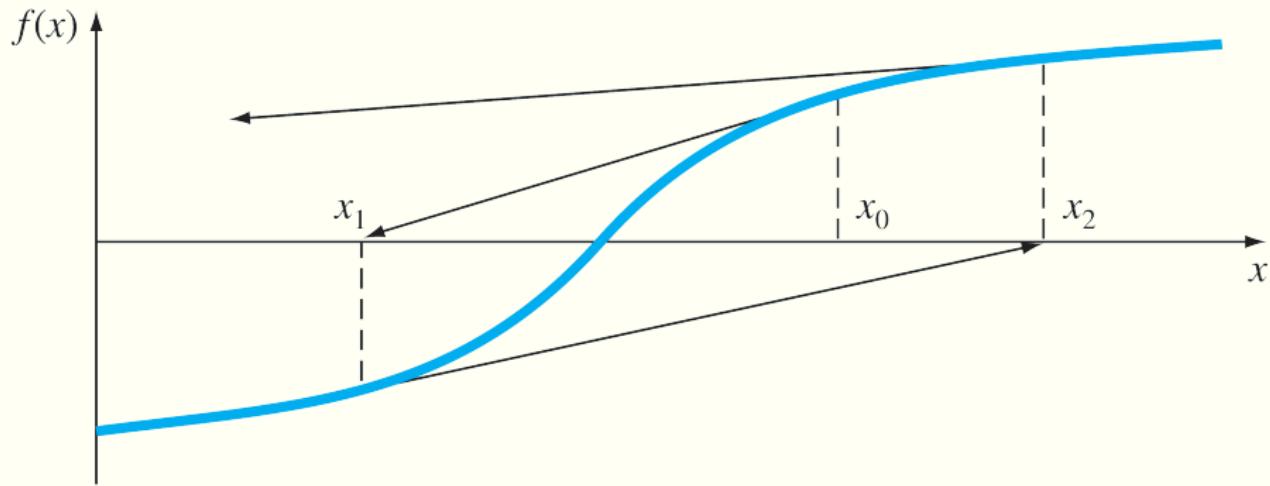
3 Newton Raphson

Newton Raphson

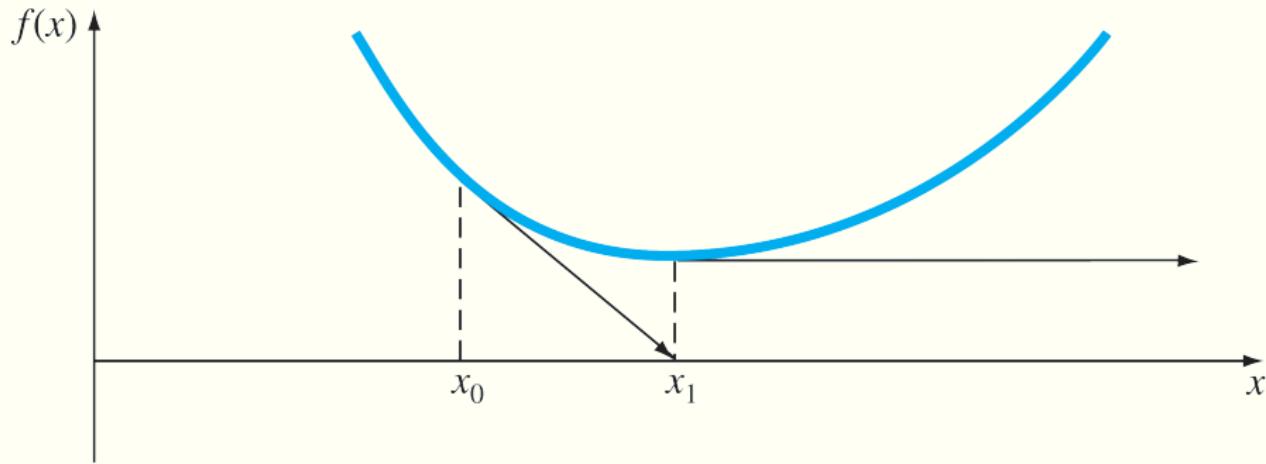
Assuming r is a root of f and that f is continuously differentiable in the vicinity of r with $f'(r) \neq 0$, then a sequence (x_n) that converges to r for $n \rightarrow \infty$ can be found using the Taylor expansion of f :

Newton-Raphson graphical expression

Newton-Raphson failure



Newton-Raphson failure



Newton-Raphson failure

