

CE 311K: Taylor series

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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?



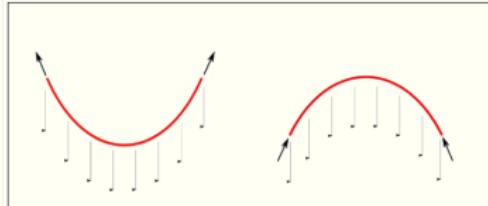
From arches to fan vaults



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



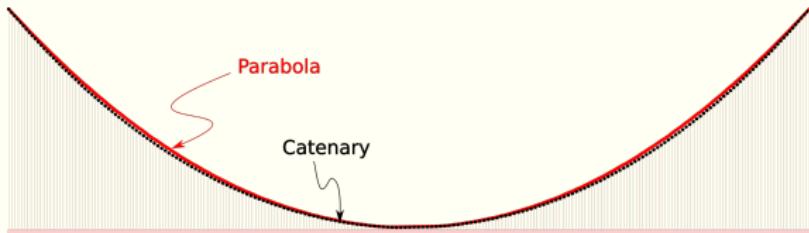
catenary design



② What is this shape?

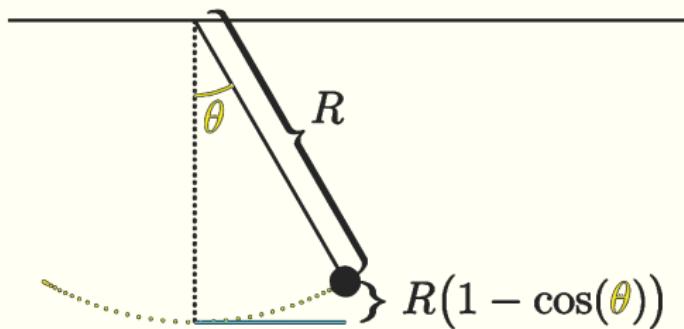


Catenary vs Parabola



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

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Taylor series

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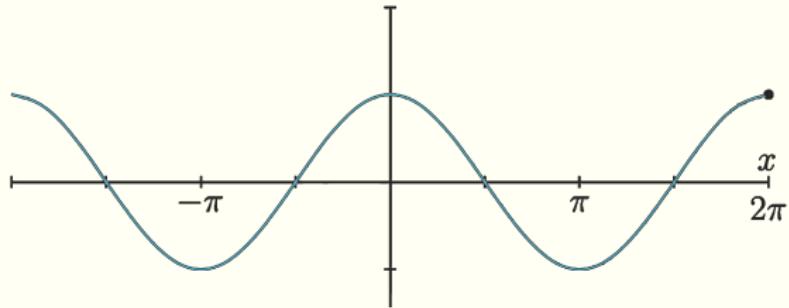
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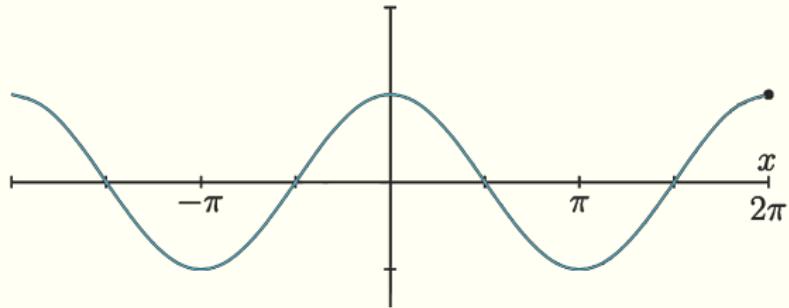
Taylor series of $\cos(x)$

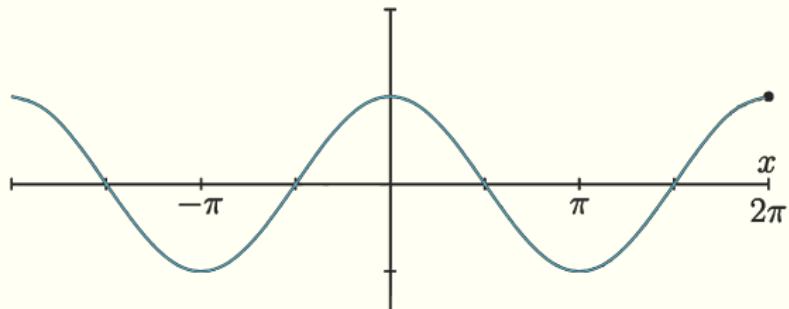
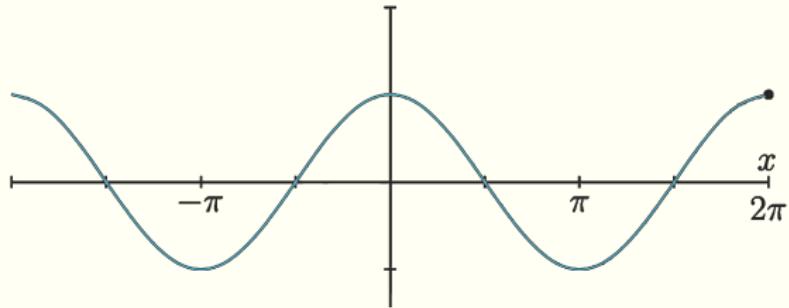
$\cos(x)$



Taylor series of $\cos(x)$

$\cos(x)$



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

Taylor series: Generalization

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Taylor series: Generalization

1 Catenary vs Parabola

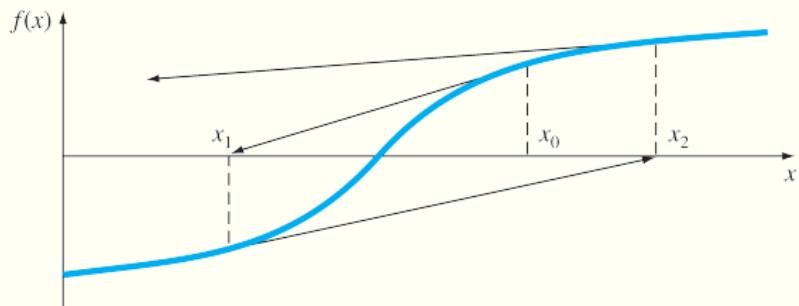
2 Taylor series

3 Newton Raphson

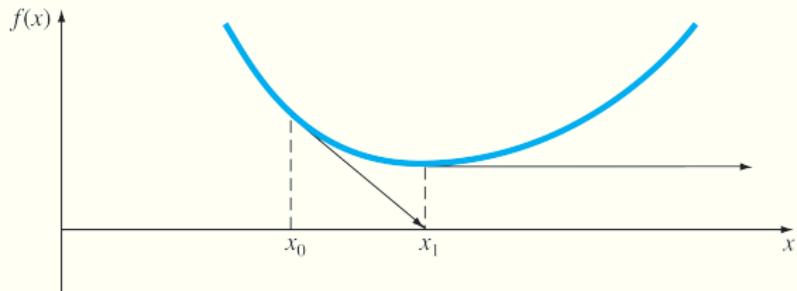
Newton Raphson

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 failure



Newton-Raphson failure



Newton-Raphson failure

