Math 119
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Approximation Methods

why approximate in Calculus?
- to simplify solutions to difficult problems
- to find approximate solutions to problems that are not solveable analytically

e.g. $\int_0^1 e^{-x^2}\,dx$ (error function - erf)

(but FTC says any continuous function has an antiderivative) *

no antiderivative of e^{-x^2} in terms of elementary functions

The antiderivative of e^{-x^2} exists but is not an elementary function — it is an infinite series.

To find an approximate solution, we approximate e^{-x^2} by a polynomial (which one?)

We have already seen the simplest of polynomial approximation (or linearization or tangent line approximation)

If $L(x)$ is the linear approx. of $f(x)$ at $x=a$, then:

$L(x) = f(a) + f'(a)(x-a)$.

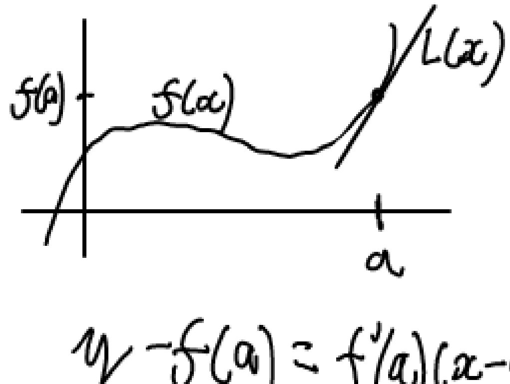
Eqn. of line thru $(a, f(a))$, with slope $f'(a)$

two important things about $L(x)$:

1) pass through same point
$L(a) = f(a)$

2) slope at a is the same
$L'(a) = f'(a)$

(only poly of deg 1 w/ these properties)



$y - f(a) = f'(a)(x-a)$