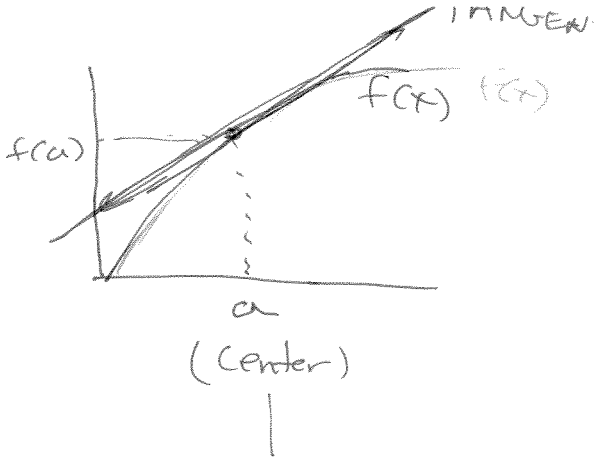
Linearizing a function



Point $(a, f(a))$ Slope of Tangent $f'(a)$

POINT SLOPE

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

$y - y_1 = m(x - x_1)$

$y = f(a) + f'(a)(x-a)$ Equation of the Tangent Line at $x=a$

Ex Find $\sqrt{10}$

$f(x) = \sqrt{x}$ Linearize at $x = 9$

$y = L(x) = f(9) + f'(9)(x-9)$

$= \sqrt{9} + \frac{1}{6}(x-9)$

$f'(x) = \frac{1}{2\sqrt{x}}$

$L(x) = 3 + \frac{1}{6}(x-9)$

$f'(9) = \frac{1}{2 \cdot 3} = \frac{1}{6}$

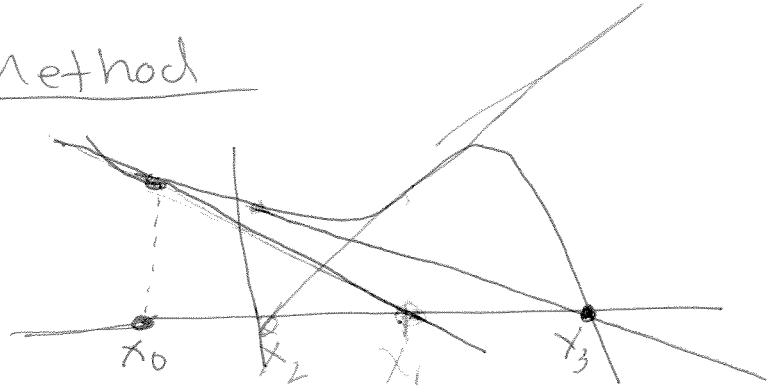
$L(10) = 3 + \frac{1}{6}(10-9) = 3\frac{1}{6}$

So $\sqrt{16} = 4$ $L(16) = 3 + \frac{1}{6}(16-9) = 4\frac{1}{6}$

Seen... $y = \sin(x)$ linearize near $x = 0$

$y = x$

Newton's Method



$y = f(x_0) + f'(x_0)(x - x_0)$

$0 = f(x_0) + f'(x_0)(x_1 - x_0)$

$-\frac{f(x_0)}{f'(x_0)} + x_0 = x_1$

$x_1 = x - y_1 / \text{nderiv}(Y_1, X, X)$