$f(x) = x^2 + 7x - 13$

$f'(x) = 2x + 7$

Tangent line @ $(x_1, f(x_1))$

$L(x) = y = f'(x_1)(x - x_1) + f(x_1) \overset{SET}{=} 0$

$\Rightarrow f'(x_1)x - f'(x_1)x_1 = -f(x_1)$

$\Rightarrow f(x_1)x = f'(x_1)x_1 - f(x_1)$

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

$$x = x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$

x_2 from seed value of x_1

Replicate the moves by hand:

$f(x) = x^2 + 7x - 13$

$f'(x) = 2x + 7$

$x_2 = x_1 - \dfrac{x_1^2 + 7x_1 - 13}{2x_1 + 7}$ $\quad x_1 = 0$

$x_2 = 0 - \dfrac{-13}{7} = \dfrac{13}{7}$

$x_3 = \dfrac{13}{7} - \dfrac{\left(\frac{13}{7}\right)^2 + 7\left(\frac{13}{7}\right) - 13}{2\left(\frac{13}{7}\right) + 7}$

$= \dfrac{13}{7} - \dfrac{\frac{169}{49} + \cancel{\frac{49(13)}{49}} - \cancel{\frac{13(49)}{49}}}{\frac{26}{7} + \frac{49}{7}}$

$\begin{array}{r} 49 \\ \times 13 \\ \hline 147 \\ 490 \\ \hline 637 \end{array}$

$\begin{array}{r} 225 \\ 750 \end{array}$

$= \dfrac{13}{7} - \dfrac{\frac{169}{49}}{\frac{75}{7}} = \dfrac{13}{7} - \dfrac{169}{49} \cdot \dfrac{7}{75}$

$= \dfrac{13}{7} - \dfrac{169}{7(75)} = \dfrac{13}{7} \cdot - \dfrac{169}{7(75)}$

$= \dfrac{13(75) - 169}{7(75)} = \dfrac{975 - 169}{7(75)}$

$= \dfrac{806}{7(75)}$

$= \dfrac{806}{7(75)}$

Sorry for the waste of time on silly arithmetic.

You can do these pretty easily with a scientific calculator.

Zeros of $\sin(x) - \frac{1}{2}x = f(x)$

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

$$x_{n+1} = x_n - \frac{\sin(x_1) - \frac{1}{2}x_1}{\cos(x_1) - \frac{1}{2}}$$

All that remains in Chapter 3 is Antiderivatives.

$\int (x^2 - 2x + 1)\,dx = \frac{1}{3}x^3 - x^2 + x$ + ANY constant, because

$$\frac{d}{dx}\left[\frac{1}{3}x^3 - x^2 + x\right] = x^2 - 2x + 1$$

$\int (x^2 - 2x + 1)\,dx = \frac{1}{3}x^3 - x^2 + x + C$, where C = any constant

$$\int \sin(x)\,dx = -\cos(x) + C$$

$$\int \cos(x)\,dx = \sin(x) + C$$

$$\cancel{\int \tan(x)\,dx = \ln|\sec(x)| + C}$$

$$\int \sec^2(x)\,dx = \tan(x) + C$$

$$\int \csc^2(x)\,dx = -\cot(x) + C$$

Power Rule $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$

The power rule only works for *n* not equal to -1.

$$\int x^{-1}dx = \int \frac{1}{x}dx = \ln|x| + C$$

Chain Rule Version:

$$\int \frac{f'(x)\,dx}{f(x)} = \ln|f(x)| + C$$

$$\int \tan(x)\,dx = -\int \frac{-\sin(x)\,dx}{\cos(x)} = -\ln|\cos(x)| + C$$

$$= \ln\left(|\cos(x)|^{-1}\right) + C$$

$$= \ln|\sec(x)| + C$$

$f(x) = \cos(x)$

$f'(x) = -\sin(x)$

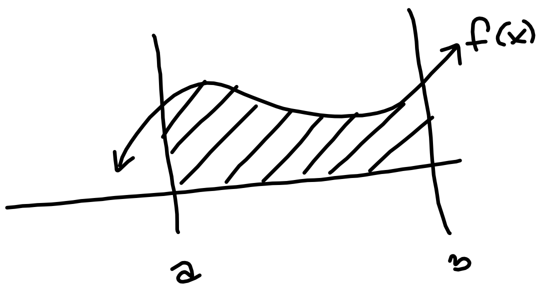
In Chapter 1, we learned that the derivative is the slope of a curve.

In Chapter 4, we will learn that antiderivatives will give us the Area Under the Curve!

(We need the Fundamental Theorem(s) of Calculus for that.)

FTC I: $\frac{d}{dx}\left[\int_a^x f(x)\,dx\right] = f(x)$

FTC II: $\int_a^b f'(x)\,dx = f(b) - f(a)$ for any antiderivative f of f'.



Shaded Area is $\int_a^b f(x)\,dx$