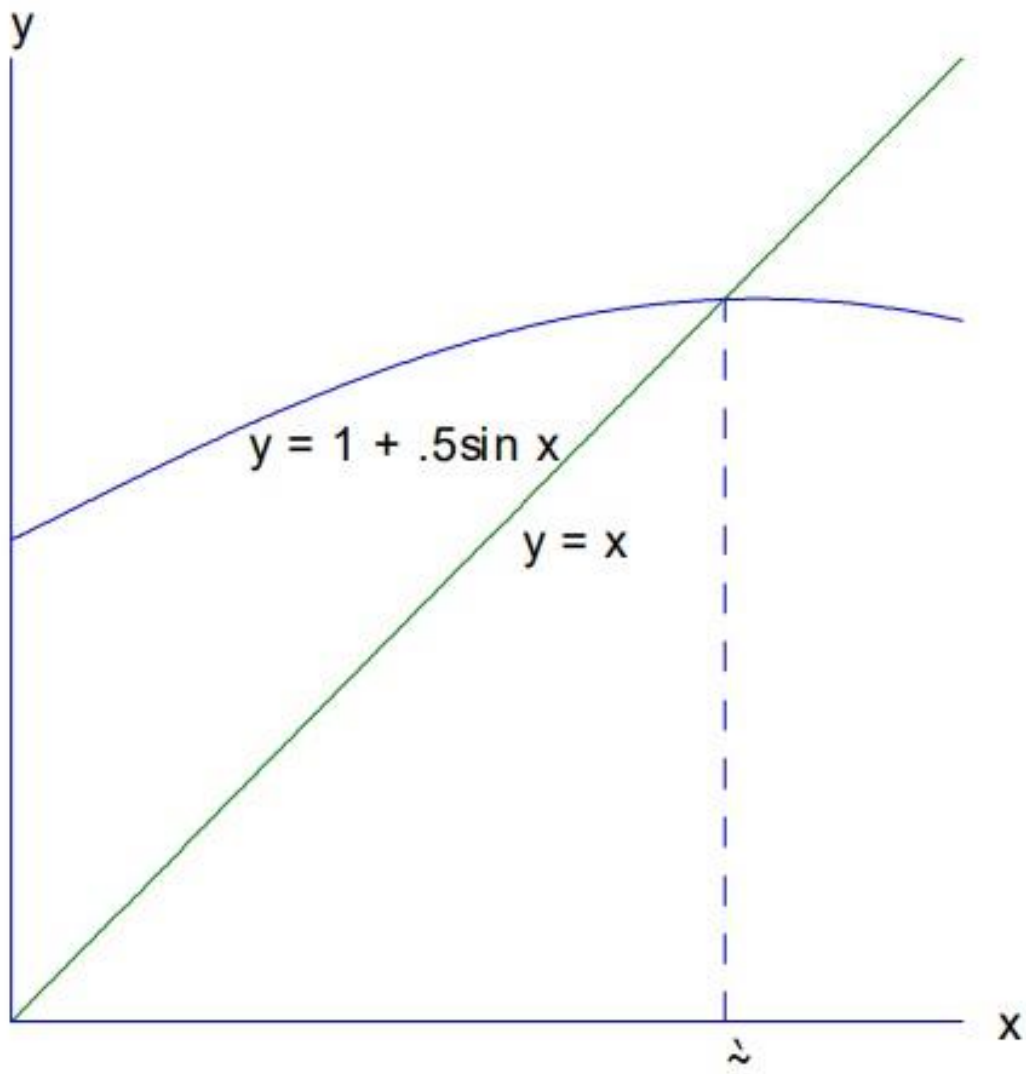
Fixed Point Iteration

We begin with a computational example. Consider solving the equations

$$E1: \quad x = 1 + 0.5 \sin x$$

We are going to use a numerical scheme called fixed point iteration. It amounts to making an initial guess of $\mathbf{x_0}$ and substituting this into the right side of the equation. The resulting value is denoted by $\mathbf{x_1}$; and then the process is repeated, this time substituting $\mathbf{x_1}$ into the right side. This is repeated until convergence occurs or until the iteration is terminated.


y
y = 1 + .5sin x
y = x
x

$$\mathsf{E} : \quad x = 1 + .5 \sin x$$

	E
n	x_n
0	0.00000000000000
1	1.00000000000000
2	1.42073549240395
3	1.49438099256432
4	1.49854088439917
5	1.49869535552190
6	1.49870092540704
7	1.49870112602244
8	1.49870113324789
9	1.49870113350813
10	1.49870113351750

Example: use the fixed-point iteration to solve the equation :

$$4\,x^2 = 10 - x^3$$

we can write the equation as

$$x^2 = \tfrac{1}{4}\,(10 - x^3)$$

$$x^2 = 0.25\,(10 - x^3)$$

$$x = 0.5\,(10 - x^3)^{0.5}$$

Set the initial guess for x, error, N

x : our guess for solve number

N : max number of iterations

```
x = 0;
for i = 1: 100
    y = 0.5*((10 - (x^3))^0.5);
      if x == y
        disp ( ' iteration        x           y ' )
        disp([ i' , x', y'])
        return
      end
  x = y;
end
```