Closed Methods in Finding the root of non-linear system

1. Bisection
   - Determine $xm = \frac{xl+xu}{2}$
   - Find $f(xl), f(xm), f(xu)$
   - Choose new interval (*find the interval with 2 different signts (+,-)*)

Example Problem Determine the root of $3x^4 + 7x^3 - 15x^2 + 5x = 17$ between $[0, 2]$. Use Bisection Method for 7 iterations.

#	x_l	x_m	x_u	$f(x_l)$	$f(x_m)$	$f(x_u)$	New
1	0	1	2				

1st iteration

$$x_m = \frac{x_l + x_u}{2}$$
$$= \frac{0 + 2}{2}$$
$$x_m = 1$$
$$f(x_l) = 3(0)^4 + 7(0)^3 - 15(0)^2 + 5(0) - 17$$
$$= 0 + 0 - 9 + 0 - 17$$
$$= -17$$
$$f(x_m) = 3(1)^4 + 7(1)^3 - 15(1)^2 + 5(1) - 17$$
$$= 3 + 7 - 15 + 5 - 17$$
$$= -17$$