$\boxed{3.6 \text{ WS} \rightarrow \#\text{'s } 7 + 8}$

Finding Bounds on Zeros

Let f denote a polynomial function whose leading coefficient is 1.

$$f(x) = x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0$$

A bound M on the zeros of f is the smaller of the following 2 values:

1. $\text{Max}\{1, |a_0| + |a_1| + \ldots + |a_{n-1}|\}$

or

2. $1 + \text{Max}\{|a_0|, |a_1|, \ldots, |a_{n-1}|\}$

where Max { } means "choose the largest entry in { }."

7.) Find a bound to the zeros of each polynomial, then graph.

A.) $f(x) = x^5 + 3x^3 - 9x^2 + 5$

* The lead coefficient of f is already 1, so we don't have to factor it out.

1. $\text{Max}\{1, |3| + |-9| + |5|\} = \underline{17}$
2. $1 + \text{Max}\{|3|, |-9|, |5|\} = 1 + 9 = \underline{10}$

* The smaller of the two #'s is 10, so 10 is the bound. Thus, the zeros of f must fall b/w −10 + 10.

B.) $g(x) = 4x^5 - 2x^3 + 2x^2 + 1$

* factor out a 4

$g(x) = 4\left(x^5 - \frac{1}{2}x^3 + \frac{1}{2}x^2 + \frac{1}{4}\right)$

1. $\text{Max}\{1, |-\frac{1}{2}| + |\frac{1}{2}| + |\frac{1}{4}|\} = \frac{5}{4}$
2. $1 + \text{Max}\{|-\frac{1}{2}|, |\frac{1}{2}|, |\frac{1}{4}|\} = 1 + \frac{1}{2} = \frac{3}{2}$

* The smaller of the two #'s circled above is $\frac{5}{4}$, so the bound is $\boxed{\frac{5}{4}}$. Zeros of g are b/w −5/4 + 5/4

7 (continued) → For graphing part of #7, just graph on your graphing calcs (using the bounds) as your x min & x max.

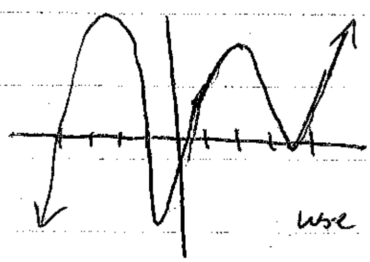
8.) Find the real zeros of the polynomial function
$f(x) = x^5 - 1.8x^4 - 17.79x^3 + 31.672x^2 + 37.95x - 8.7121$

- Quickly find the bound to determine your x-min & x-max:

① $\max\{1, |-1.8| + |-17.79| + |31.672| + |37.95| + |-8.7121|\}$
$\hookrightarrow = \max\{1, 97.9241\} = 97.9241$

② $1 + \max\{|-1.8|, |-17.79|, |31.672|, |37.95|, |-8.7121|\}$
$1 + 37.95 = 38.95$

The bound is 38.95, so X-min = -38.95 & X-max = 38.95 to start. You'll see after graphing that you could narrow the x-min & x-max to -5 & 5 to get a good looking graph.



Zeros at → x = -4, -1, .2,

use the table around 3.3 to see that there is a zero b/w 3.29 & 3.30, and another zero b/w 3.30 & 3.31.