(* If degree (highest power) is even then the nature of the polynomial function in
 the left and right side of the x will be similar (either both will go up or down)
 when x is very large. If degree (highest power) is odd then the nature of
 the polynomial function in the left and right side of the x will be opposite
 (if one goes up the other will go down) when x is very large. If degree is even then
 then both side will go up when the coefficient of the term with highest power is
 positive and both will go down when it is negative. If degree is odd then the right
 side will go up and left side will go down when the coefficient of the term with
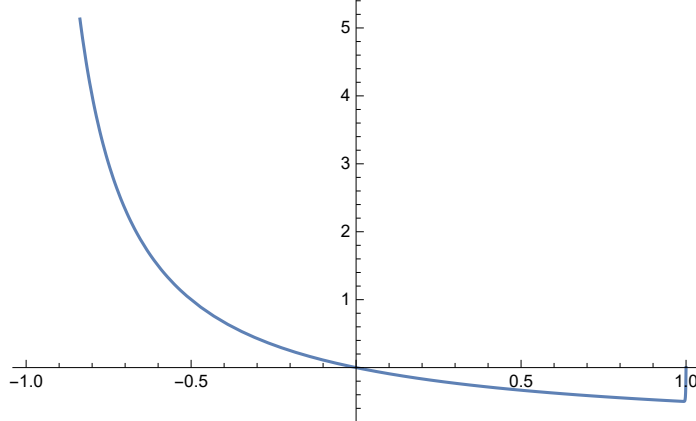 highest power is positive and the reverse occurs when the coefficient is negative*)

In[2]:= $f[x\_] := \sum_{n=1}^{1000} (-1)^n x^n;$ (* degree=1000 (even),
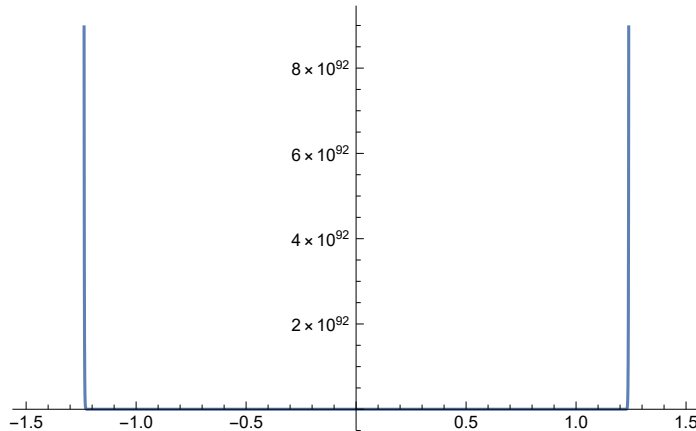
coefficient of x^{1000} is positive *)
Plot[f[x], {x, -1, 1}]
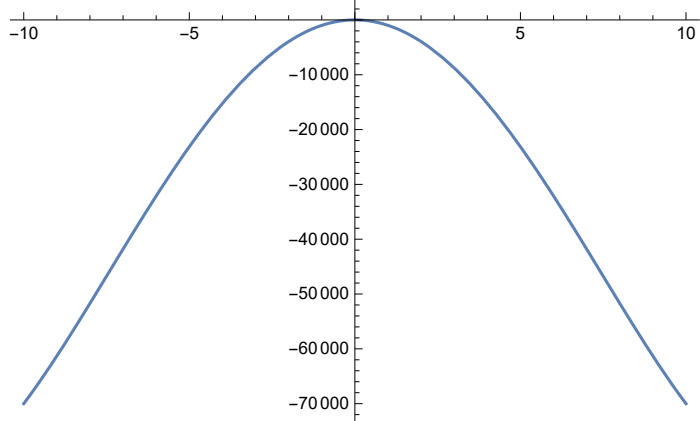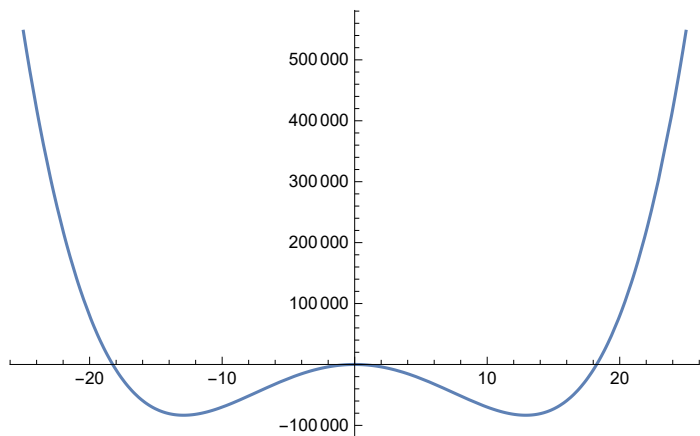Plot[f[x], {x, -1.5, 1.5}]

Out[3]=

Out[4]=

In[5]:= `f[x_] := 3 x^4 - 1000 x^2;`   `(* degree=4 (even), coefficient of x^4 is positive *)`
`Plot[f[x], {x, -10, 10}]`
`Plot[f[x], {x, -25, 25}]`
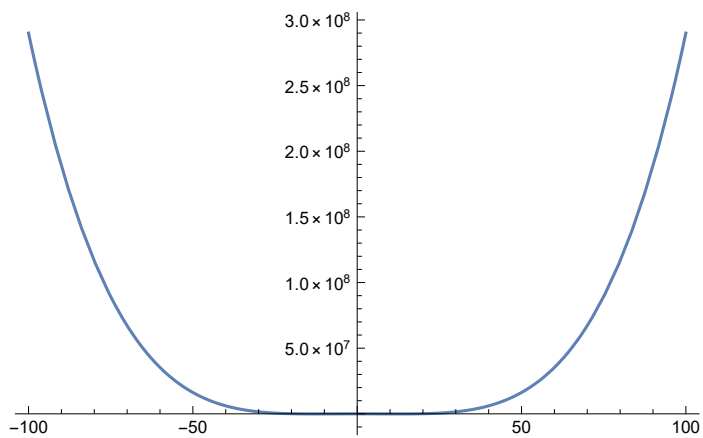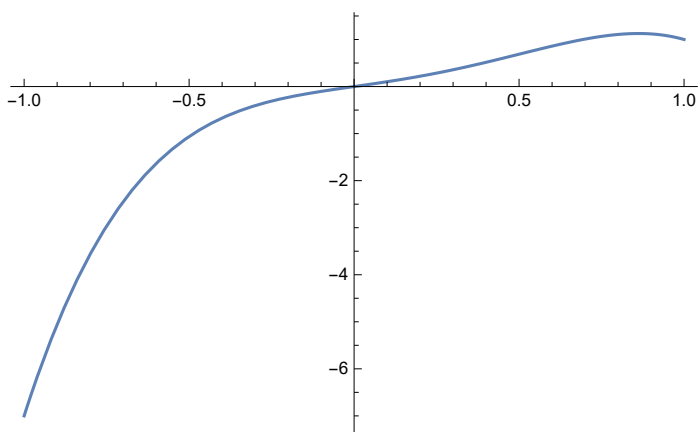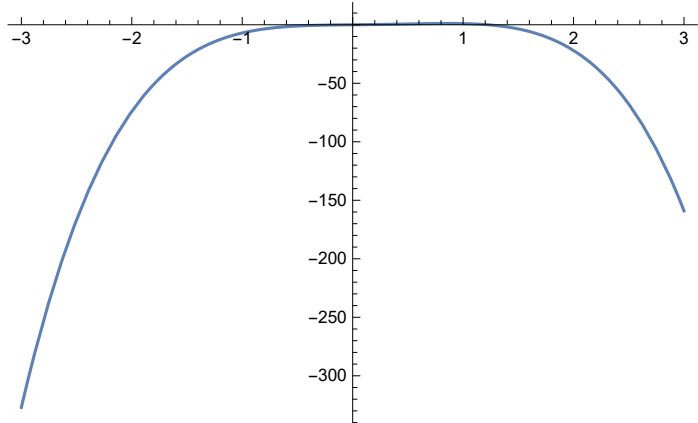`Plot[f[x], {x, -100, 100}]`

Out[6]=

Out[7]=

Out[8]=

In[9]:= `f[x_] := -3 x^4 + 3 x^3 + x;`   `(* degree=4 (even), coefficient of x^4 is negative *)`
`Plot[f[x], {x, -1, 1}]`
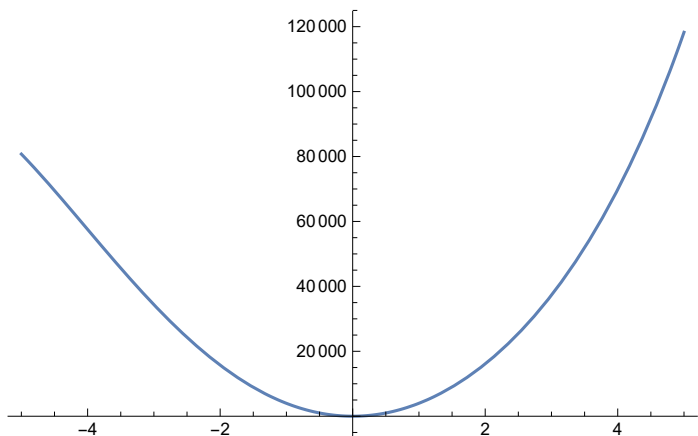`Plot[f[x], {x, -3, 3}]`
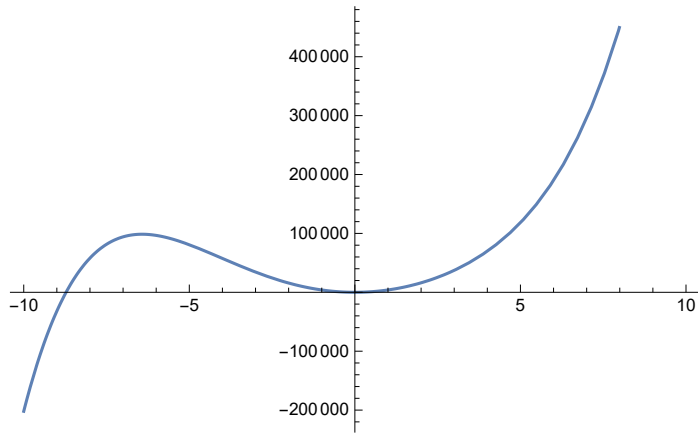
Out[10]=

Out[11]=

In[12]:= `f[x_] := 6 x^5 + 3980 x^2 + x + 5;`   `(* degree=5 (odd), coefficient of x^5 is positive *)`
`Plot[f[x], {x, -5, 5}]`
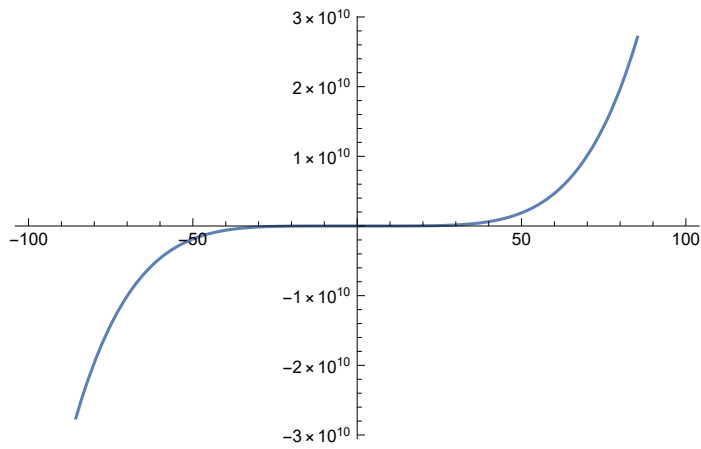`Plot[f[x], {x, -10, 10}]`
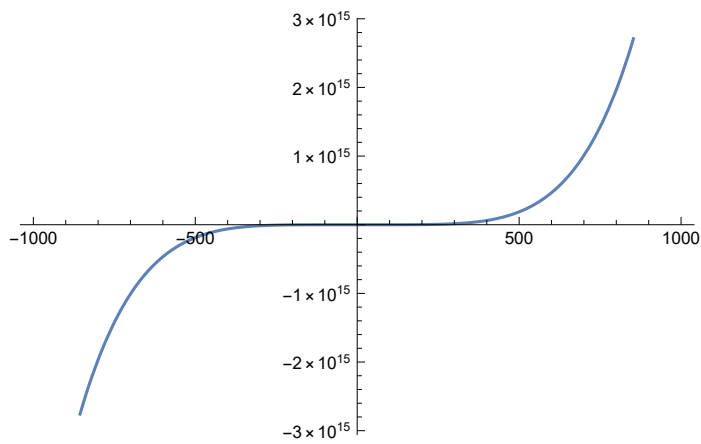`Plot[f[x], {x, -100, 100}]`
`Plot[f[x], {x, -1000, 1000}]`
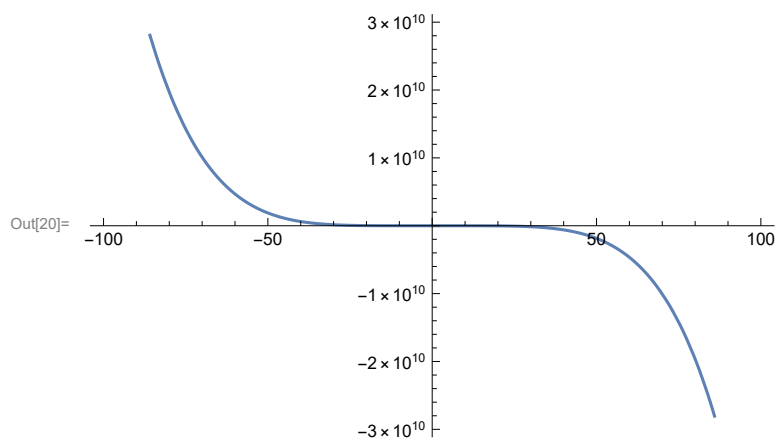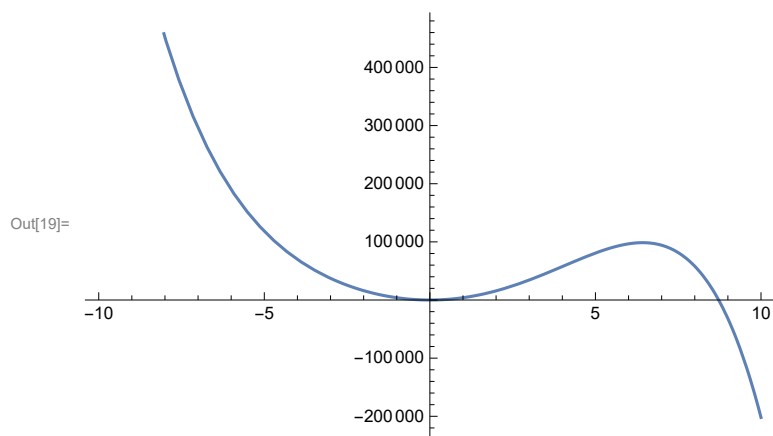
Out[13]=

Out[14]=

Out[15]=
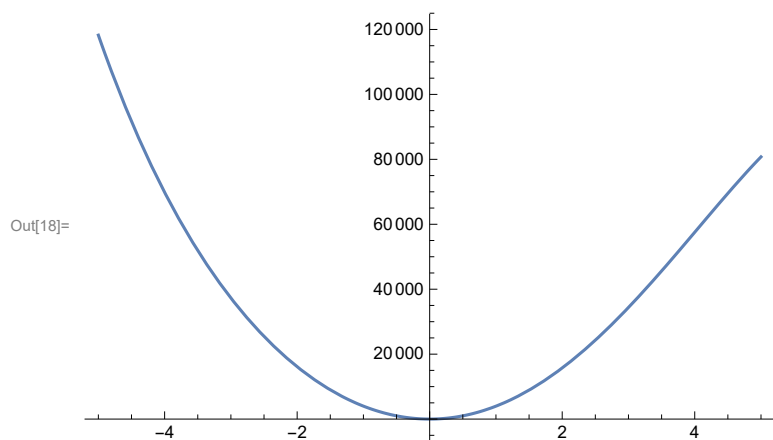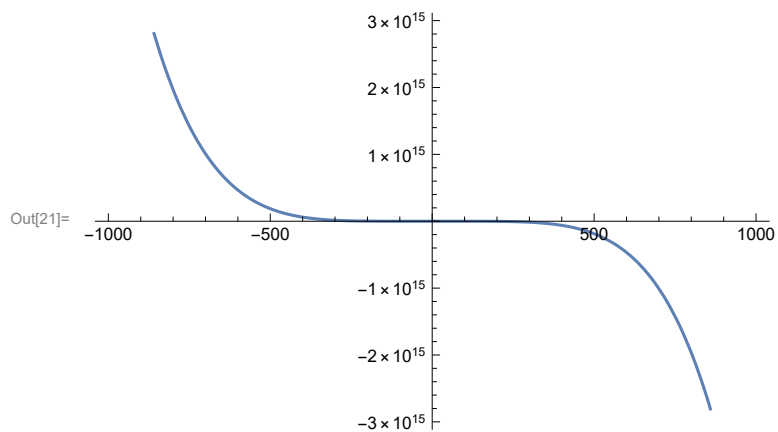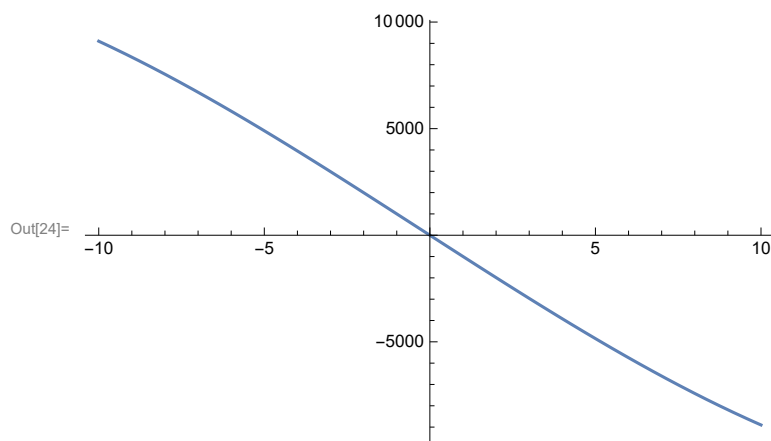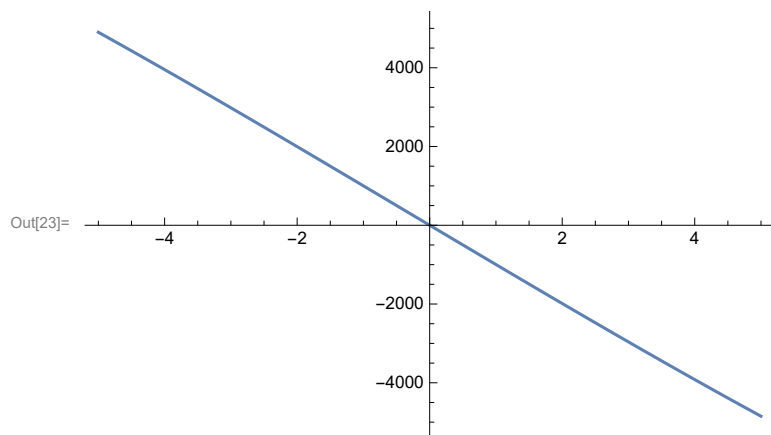

Out[16]=

In[17]:= `f[x_] := -6 x^5 + 3980 x^2 + x + 5;`   (* degree=5 (odd), coefficient of x^5 is negative *)
`Plot[f[x], {x, -5, 5}]`
`Plot[f[x], {x, -10, 10}]`
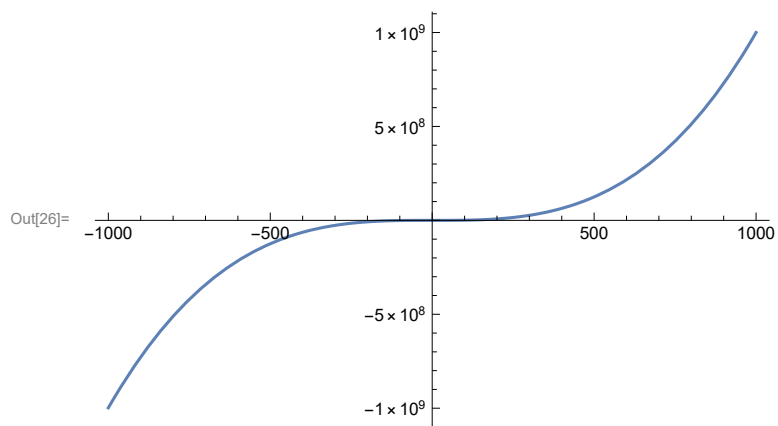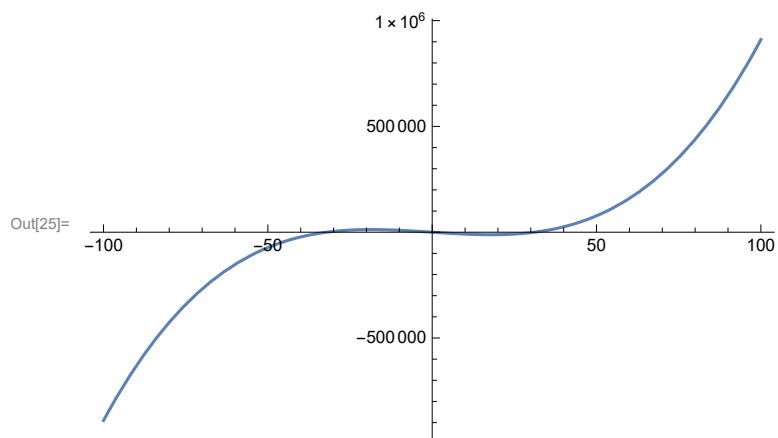`Plot[f[x], {x, -100, 100}]`
`Plot[f[x], {x, -1000, 1000}]`

Out[18]=

Out[19]=

Out[20]=

Out[21]=

In[22]:= **f[x_] := x^3 + x^2 - 1000 x + 1;   (* degree=3 (odd), coefficient of x^3 is positive *)**
Plot[f[x], {x, -5, 5}]
Plot[f[x], {x, -10, 10}]
Plot[f[x], {x, -100, 100}]
Plot[f[x], {x, -1000, 1000}]

Out[23]=

Out[24]=

Out[25]=

Out[26]=

In[27]:= `f[x_] := -x`^{10}` + x`^{2}` - 100 x`^{4}` + x`^{9}`;` `(* degree=10 (even),`
`coefficient of x`^{10}` is negative *)`
`Plot[f[x], {x, -0.01, 0.01}]`
`Plot[f[x], {x, -0.1, 0.1}]`
`Plot[f[x], {x, -10, 10}]`
`Plot[f[x], {x, -100, 100}]`
`Plot[f[x], {x, -1000, 1000}]`

Out[28]=

Out[29]=
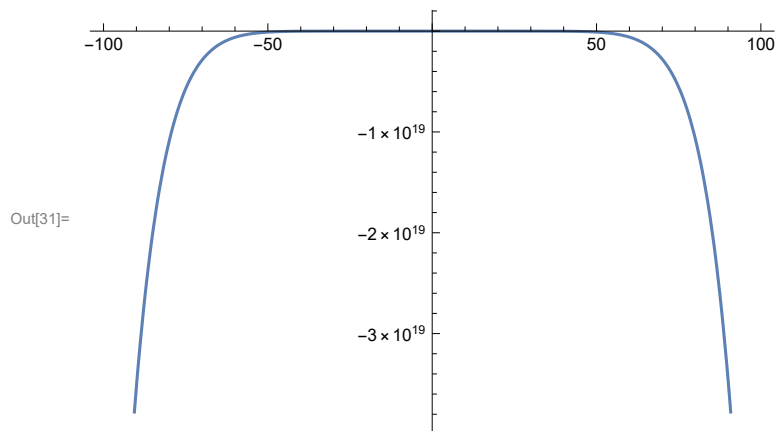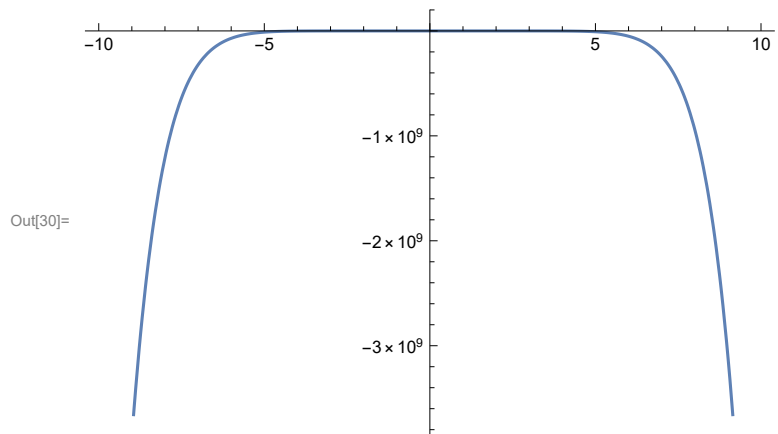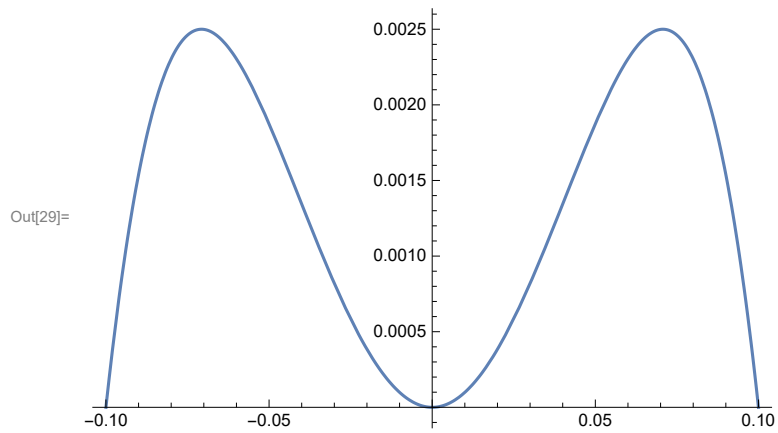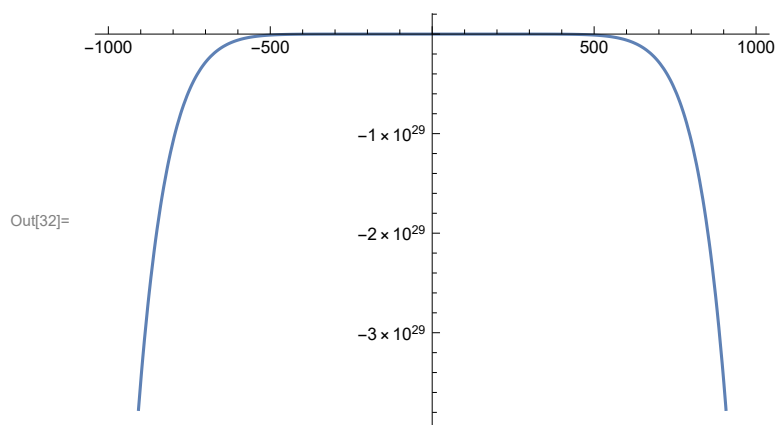

Out[30]=

Out[31]=

Out[32]=
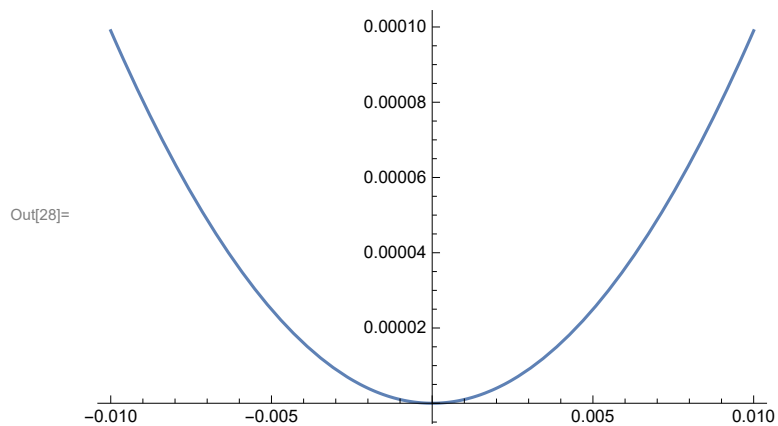
In[33]:= `f[x_] := x³ + x⁴ - 1000 x + 1;`   `(* degree=4 (even), coefficient of x⁴ is positive *)`
       `Plot[f[x], {x, -0.01, 0.01}]`
       `Plot[f[x], {x, -0.1, 0.1}]`
       `Plot[f[x], {x, -10, 10}]`
       `Plot[f[x], {x, -20, 20}]`
       `Plot[f[x], {x, -100, 100}]`
       `Plot[f[x], {x, -1000, 1000}]`

Out[34]=

Out[35]=

Out[36]=

Out[37]=

Out[38]=

Out[39]=