In[1]:= (* 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 doen 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 *)
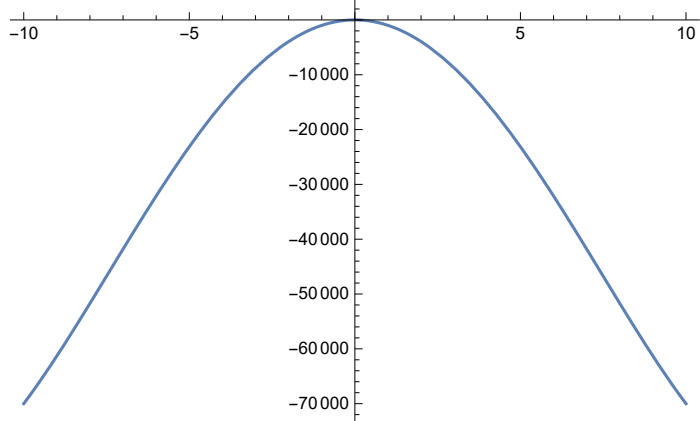   Plot[f[x], {x, -1, 1}]
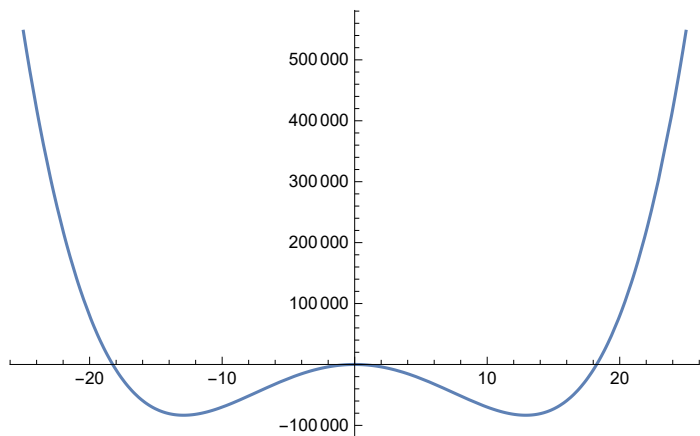   Plot[f[x], {x, -1.5, 1.5}]

Out[3]=
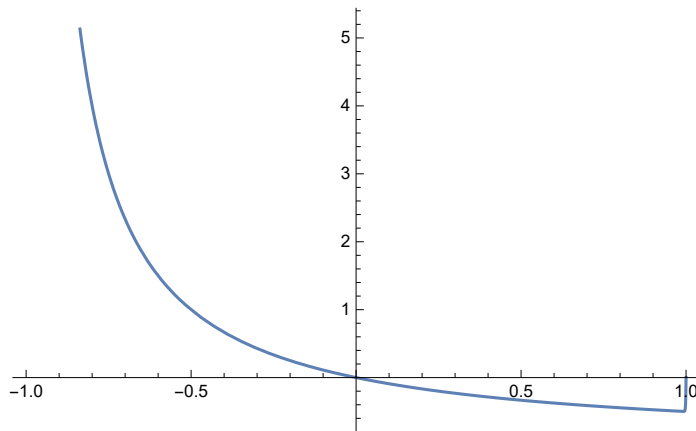
Out[4]=
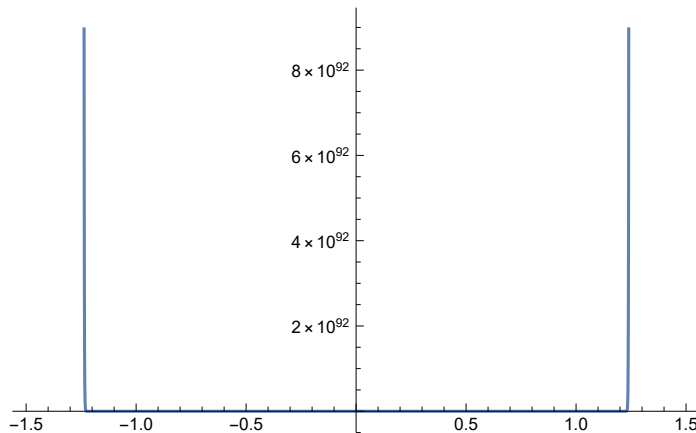
In[5]:= `f[x_] := 3 x⁴ - 1000 x²;` (* degree=4 (even), coefficient of x⁴ is positive *)
`Plot[f[x], {x, -10, 10}]`
`Plot[f[x], {x, -25, 25}]`
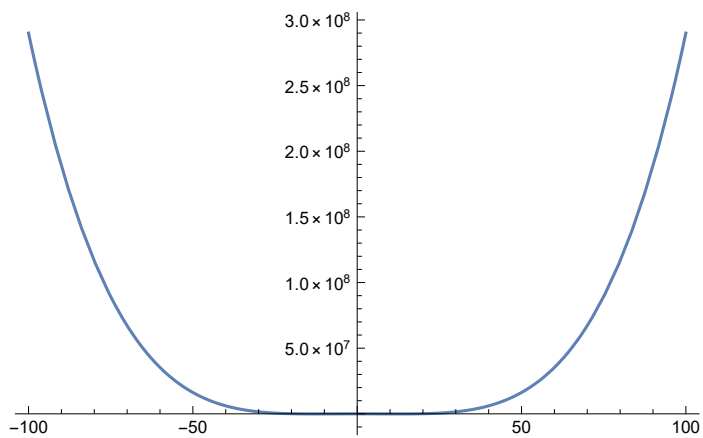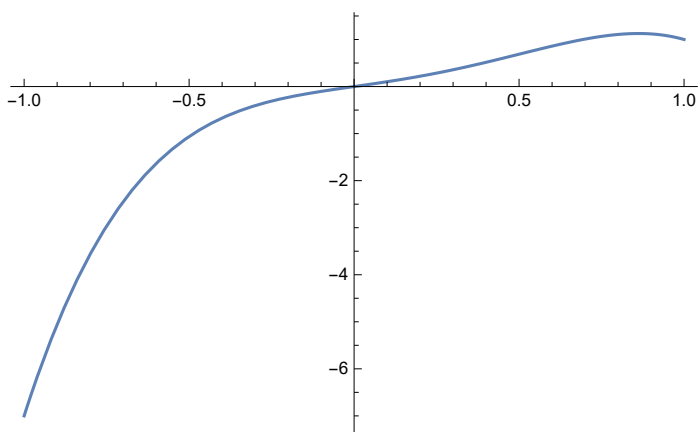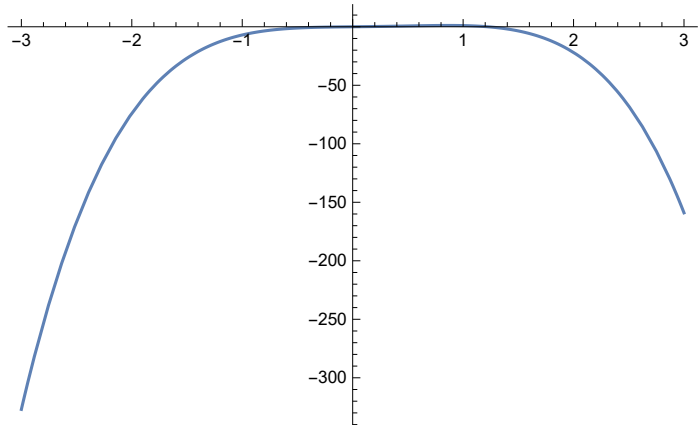`Plot[f[x], {x, -100, 100}]`

Out[6]=

Out[7]=

Out[8]=

In[9]:= `f[x_] := -3 x⁴ + 3 x³ + x;`   `(* degree=4 (even), coefficient of x⁴ is negative *)`
`Plot[f[x], {x, -1, 1}]`
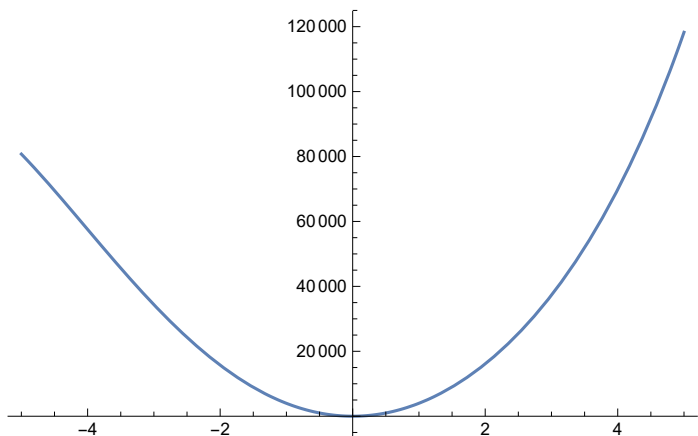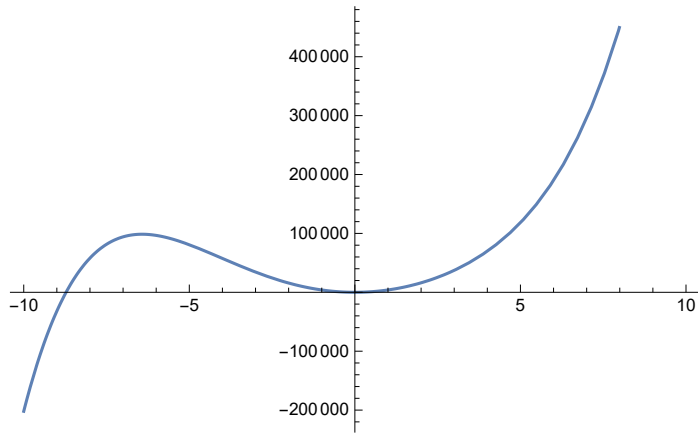`Plot[f[x], {x, -3, 3}]`

Out[10]=

Out[11]=

In[12]:= `f[x_] := 6 x⁵ + 3980 x² + x + 5;`   `(* degree=5 (odd), coefficient of x⁵ is positive *)`
`Plot[f[x], {x, -5, 5}]`
`Plot[f[x], {x, -10, 10}]`
`Plot[f[x], {x, -100, 100}]`
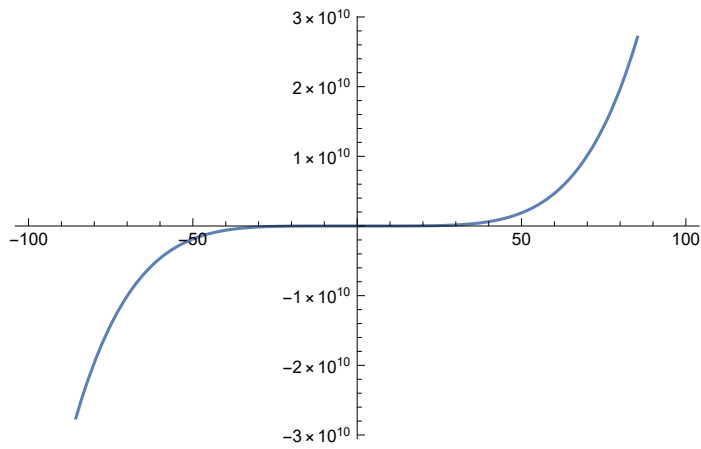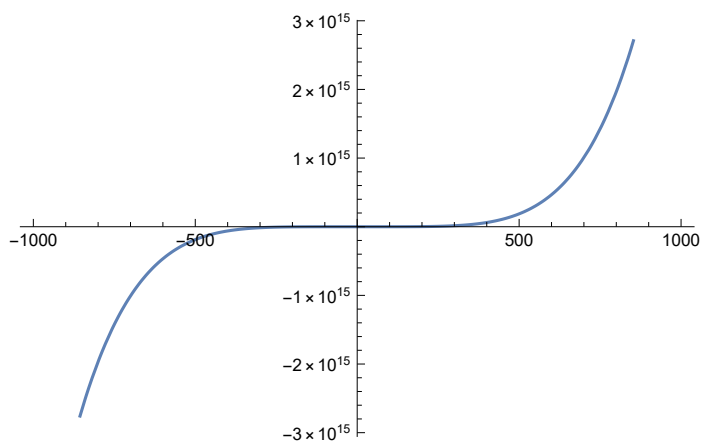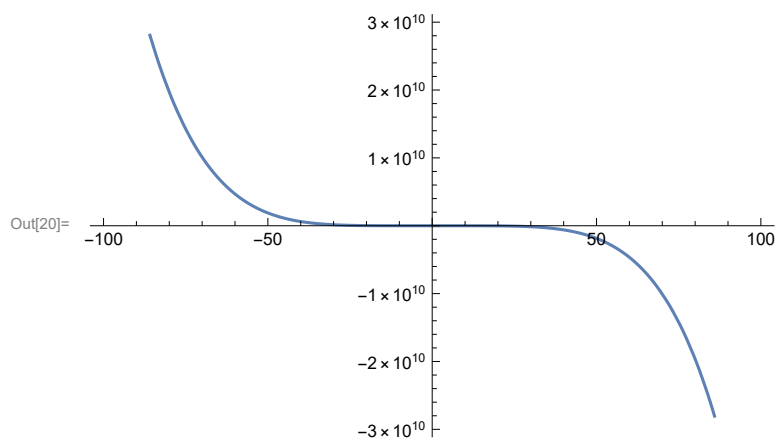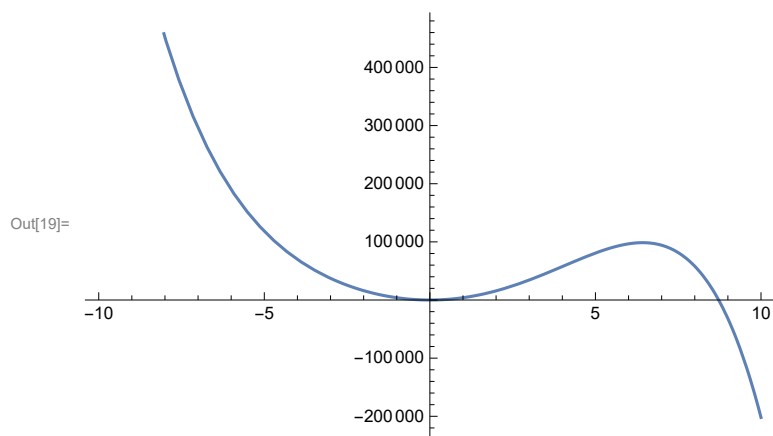`Plot[f[x], {x, -1000, 1000}]`

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 *)
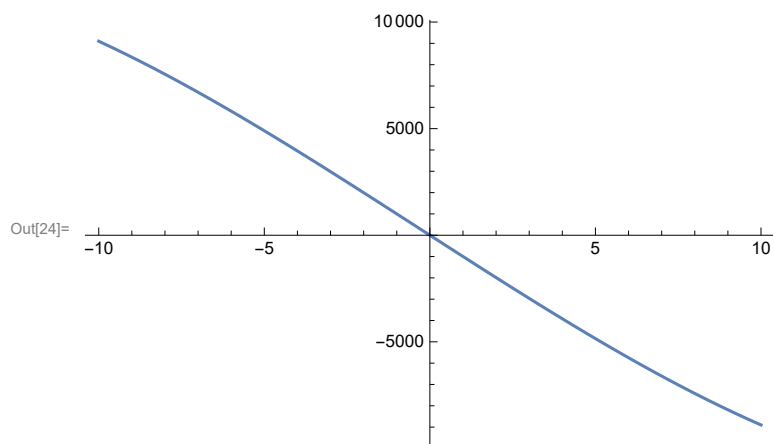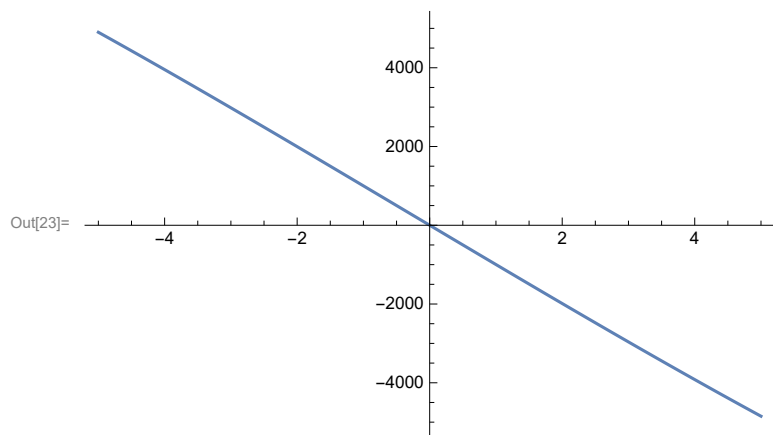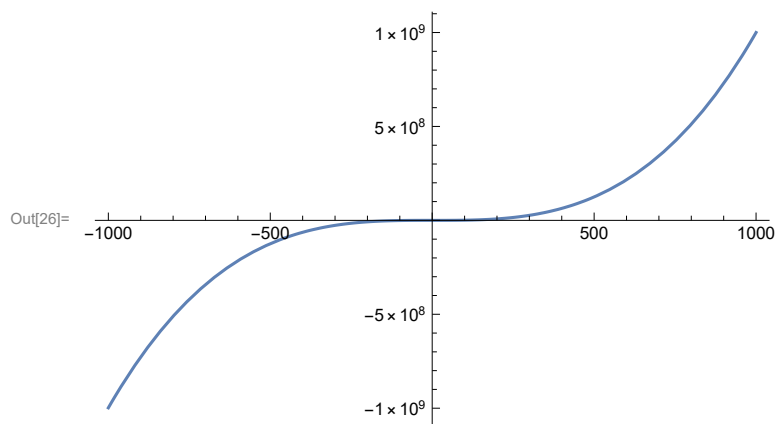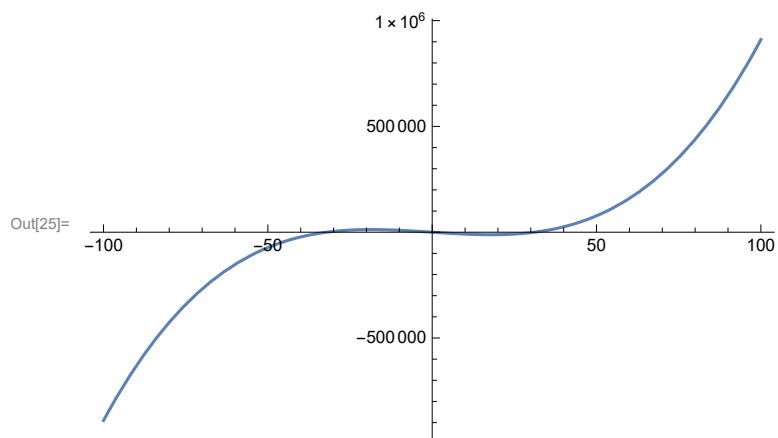`Plot[f[x], {x, -5, 5}]`
`Plot[f[x], {x, -10, 10}]`
`Plot[f[x], {x, -100, 100}]`
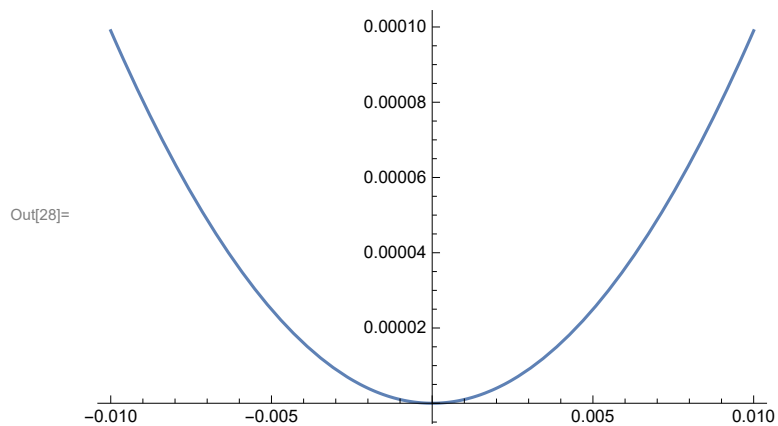`Plot[f[x], {x, -1000, 1000}]`

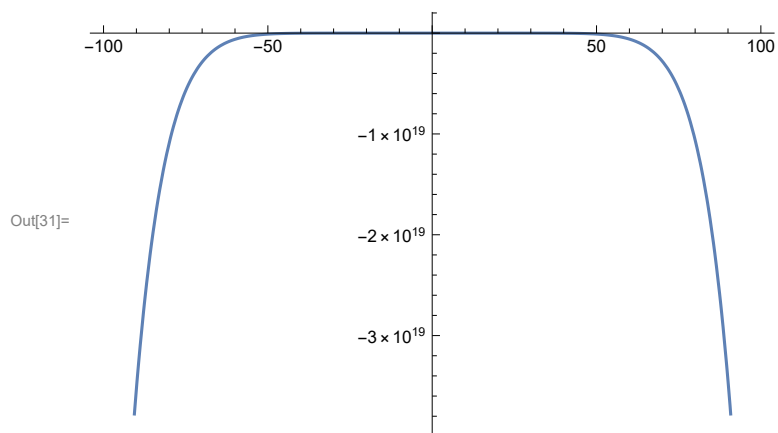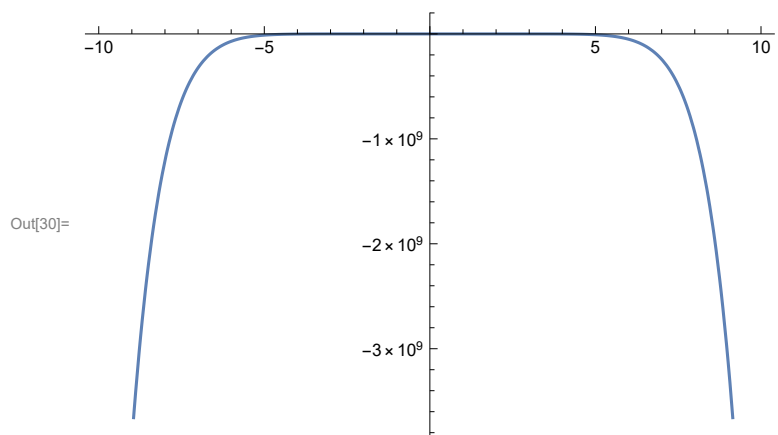Out[18]=

Out[19]=

Out[20]=

Out[21]=
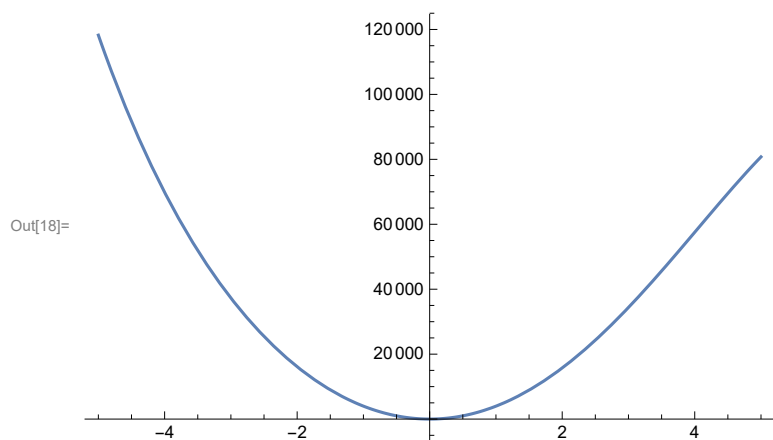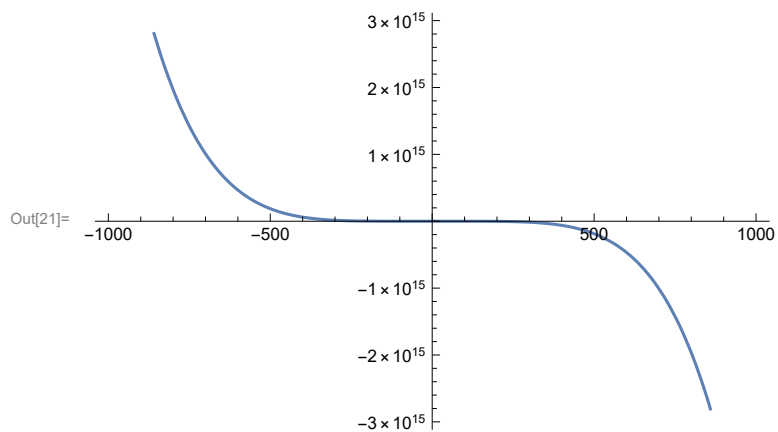
In[22]:= **f[x_] := x³ + x² - 1000 x + 1;   (* degree=3 (odd), coefficient of x³ is positive *)**
Plot[f[x], {x, -5, 5}]
Plot[f[x], {x, -10, 10}]
Plot[f[x], {x, -100, 100}]
Plot[f[x], {x, -1000, 1000}]

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}]`
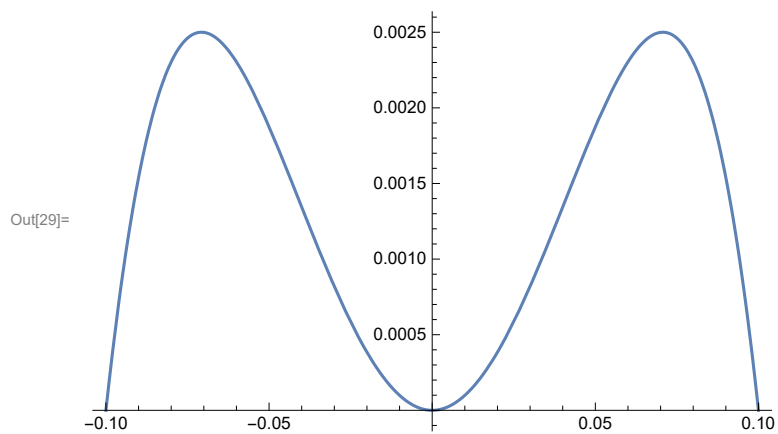`Plot[f[x], {x, -100, 100}]`
`Plot[f[x], {x, -1000, 1000}]`

Out[28]=
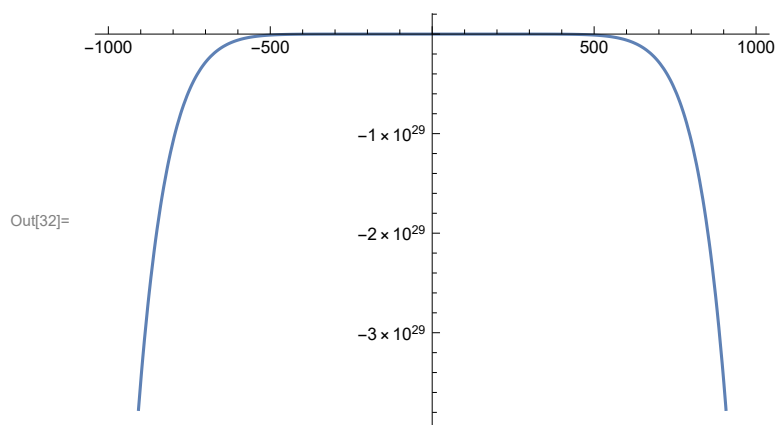
Out[29]=

Out[30]=

Out[31]=

Out[32]=

In[33]:= `f[x_] := x^3 + x^4 - 1000 x + 1;`   `(* degree=4 (even), coefficient of x^4 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]=