Extra Project 4.5d: Graphing Functions One More Time

Objective

To illustrate how Maple can be used to help in doing the curve sketching homework.

Narrative

If you have not already done so, read Section 4.5 of the text.

One of the difficulties of curve sketching is finding where the derivatives of a function are zero and where they do not exist. In this project we illustrate how Maple can be used to assist in performing this task.

Task

a) Type the command lines in the left-hand column below into Maple in the order in which they are listed. These commands are aimed at finding where the derivatives of $f(x) = (x^3 - 1)/(x^3 + 1)$ are zero and where they do not exist. The effect of each command is described in the right-hand column for your reference.

`> # Project 04.5d:  Graphing Functions One More Time`	
`> restart;`	Clear Maple's memory.
`> f := x -> (x^3-1)/(x^3+1);`	Let $f(x) = (x^3 - 1)/(x^3 + 1)$.
`> fsolve(numer(f(x))=0,x);`	Find where the numerator of $f(x)$ is 0.
`> fsolve(denom(f(x))=0,x);`	Find where the denominator of $f(x)$ is 0.
`> f1 := D(f);`	Let `f1` be f'.
`> simplef1 := simplify(f1(x));`	Simplify `f1(x)` and call the result `simplef1`.
`> fsolve(numer(simplef1)=0,x);`	Find where the numerator of $f'(x)$ is 0.
`> fsolve(denom(simplef1)=0,x);`	Find where the denominator of $f'(x)$ is 0.
`> f2 := D(f1);`	Let `f2` be f''.
`> simplef2 := simplify(f2(x));`	Simplify `f2(x)` and call the result `simplef2`.
`> fsolve(numer(simplef2)=0,x);`	Find where the numerator of $f''(x)$ is 0.
`> fsolve(denom(simplef2)=0,x);`	Find where the denominator of $f''(x)$ is 0.

b) Continue by typing the following command lines into Maple in the order in which they are listed. These commands draw an empty graph and recording strips.

```
> with(plots):
> plot0 := plot({-6,-5,-4,-3,0},x=-6..6,y=-6..3):
> plot1 := textplot([-6,-3.5,´f´],[-6,-4.5,´f1´],[-6,-5.5,´f2´]):
> display({plot0,plot1});
```

At this time, make a hard-copy of your input and Maple's responses. Then, by hand, ...

c) fill in the recording strips on the graphic you produced using information about f, f' and f'', and

d) use the information in the recording strips to sketch the graph of f.