

Graphing Functions Again

Michael Penna, Indiana University – Purdue University, Indianapolis

Objective

To get more exercise graphing a function f using its first and second derivatives.

Narrative

In this project we provide another example that involves graphing a function f using its first and second derivatives.

Task

1. Type the command lines below into Mathematica in the order in which they are listed. They produce some information about the function $f(x) = x^{2/3}(5 - x)$.

```
In[1] := (* Your name, today's date *)
In[2] := (* Graphing Functions *)
In[3] := (* Task 1 *)
In[4] := f[x_] := (x^2)^(1/3) (5-x)
In[5] := NSolve[Numerator[f[x]]==0,x]
In[6] := NSolve[Denominator[f[x]]==0,x]
In[7] := f'[x]
In[8] := f1=Simplify[%]
In[9] := NSolve[Numerator[f1]==0,x]
In[10] := NSolve[Denominator[f1]==0,x]
In[11] := f''[x]
In[12] := f2=Simplify[%]
In[13] := NSolve[Numerator[f2]==0,x]
In[14] := NSolve[Denominator[f2]==0,x]
```

2. Continue by typing the following command lines into Mathematica. They draw an empty graph and three recording strips.

```
In[15] := (* Task 2 *)
In[16] := Plot[{0,-3.5,-4.5,-5.5,-6.5}, {x,-6,6}, PlotRange->{-6.5,3}, Ticks->None]
```

At this time make a hard-copy of your typed input and Mathematica's responses. Then:

3. Fill in the recording strips on the graphic you produced using information about f , f' and f'' .
4. Use the information in the recording strips to sketch the graph of f .

Your lab report will be a hard-copy of your typed input and Mathematica's responses (both text and hand-labeled graphics).