

The Graph of a Derivative

Michael Penna, Indiana University – Purdue University, Indianapolis

Objective

To investigate the connection between the graph of a function and the graph of its derivative.

Narrative

Recall that for each x in the domain of the derivative f' of f , $f'(x)$ is the slope of the tangent line to the graph of f at x , and that f is increasing at x if and only if $f'(x) > 0$, and f is decreasing at x if and only if $f'(x) < 0$.

Task

1. Type the command lines in the left-hand column below into Maple in the order in which they are listed. These commands draw the graphs of several functions.

```
> # Your name, today's date
> # The Graph of a Derivative
> restart;
> f1 := x -> (trunc(x)+1)/2;
> plot(f1(x),x=0..3,y=0..3,discont=true,scaling=constrained);
> f1 := x -> piecewise(x<1, 0.5, x<2, -0.5, x<3, 1);
> plot(f1(x),x=0..3,discont=true,scaling=constrained);
> f1 := x -> piecewise(x<1, x, x<2, x-1, x<3, x-2);
> plot(f1(x),x=0..3,discont=true,scaling=constrained);
> f1 := x -> piecewise(x<1, x, x<3, -x+2, x>3, x-4);
> plot(f1(x),x=0..4,scaling=constrained);
```

At this point, make a hard-copy of your typed input and Maple's responses. Then:

2. For each graphic you created in Task 1, assume that f_1 is the derivative f' of some function f for which $f(0) = 0$, and draw by hand the graph of f (on the same graphic).
3. On each of the four graphics you created in this project, label the graph of f and the graph of f' .

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