

### Extra Project 1.3a: Variations in the Graph of a Function

#### Objective

To illustrate the variations in the graph of a function that result from variations in the way the function is specified.

#### Narrative

If you have not already done so, read Section 1.3 of the text.

In this project, we investigate the variations in the graph of the function  $f$  that result from varying the definition of  $f$ .

#### Task

a) Type the command lines below into Maple in the order in which they are listed. They produce a graph of  $f(x) = x^3 - x$ .

```
> # Project 1.3a: Variations in the Graph of a Function
> restart;                               Clear Maple's memory.
> f := x -> x^3-x;                       Let  $f(x) = x^3 - x$ .
> plot(f(x),x=-4..4,y=-6..6);           Plot the graph of  $f$  over the interval  $[-4, 4]$ .
```

b) Continue by typing the following lines into Maple.

```
> plot({f(x),f(x+2),f(x-2),f(x)+2,f(x)-2},x=-4..4,y=-6..6);
> plot({f(x),f(2*x),f(x/2),2*f(x),f(x)/2},x=-4..4,y=-6..6);
> plot({f(x),f(-2*x),f(-x/2),-2*f(x),-f(x)/2},x=-4..4,y=-6..6);
```

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

c) label the curves in each of the plots you produced in part (b). For example, label the graph of  $f$  in each plot by  $y = f(x)$ . (If your hard-copy will not be in color, it might be useful to refer to the color output on your computer monitor when doing this labeling.)