First load plots and student:

```
> with( student):with (plots):
```

Chapter 1 Review Problem 16. p. 85 OPTIMAL SELLING PRICE

A manufacturer can produce bookcases at a cost of 80 dollars apiece. Sales figures indicate that if the bookcases are sold for x dollars apiece, approximately 150 - x will be sold each month. Express a manufacturer's monthly profit as a function of the selling price x, draw the graph, and estimate the optimal selling price.

BEWARE: The text formulation of the Demand Function p = D(x) assumes that x is the NUMBER OF UNITS PRODUCED EACH MONTH, but the statement of the problem asks for the answer in terms of the PRICE.

So, after thinking about it, I used new names for the variables.

Let

- p = selling price,
- q = units produced each month
- q = 150 - p, the [monthly] demand as a function of price

The [monthly] Revenue is (number of units)*(price) = q * p = (150-p)*p, and the Cost is 80*q = 80*(150 - p) dollars (dollars/month?).

The Profit is Revenue - Cost, so

```
> Revenue:= proc(p)
   description `Revenue at price p`; 
   (150 - p) * p:
   end proc;
```

\[ Revenue := \text{proc}(p) \text{ description } `\text{Revenue at price } p` ; (150 - p) * p \text{ end proc} \] (1)

```
> Cost:= proc(p)
   description `Cost at price p`;
   80 * (150 -p);
   end proc;
```

\[ Cost := \text{proc}(p) \text{ description } `\text{Cost at price } p` ; 12000 - 80 * p \text{ end proc} \] (2)

```
> Profit:= proc(p)
   description `Profit at price p`;
   Revenue(p) - Cost(p):
   end proc;
```

\[ Profit := \text{proc}(p) \text{ description } `\text{Profit at price } p` ; \text{Revenue}(p) - \text{Cost}(p) \text{ end proc} \] (3)

```
> simplify([Revenue(p),Cost(p),Profit(p)]);
```

\[ [-(-150 + p) p, 12000 - 80 p, 230 p - p^2 - 12000] \] (4)
The maximum profit occurs when the price is 115 dollars, 35 units are produced, and the profit is 1225 dollars.