

Optimization using Ti- 84  
(Using Ti-84 solving an equation)

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**Optimization using Ti-84** The following function is from a project in the last year.

The Demand Function  $D(x)$

$$D(x) = \frac{1263.36}{1 + 0.09e^{0.28x}}$$

The Revenue Function  $R(x)$

$$R(x) = xD(x) = \frac{1263.36x}{1 + 0.09e^{0.28x}}$$

Question: Find the **price** which gives the **maximal** revenue.

$$0 < x < 30$$

Method: *We need to solve the equation  $R'(x) = 0$  using Ti-84.*

```

Plot1 Plot2 Plot3
\Y1 = 1263.36X / (1 - 0.05X)
\Y2 = d/dX (Y1) | X=X0
\Y3 =
\Y4 =
\Y5 =

```

```

Plot1 Plot2 Plot3
\Y1 = 1263.36X / (1 - 0.05X)
\Y2 = d/dX (Y1) | X=X
\Y3 =
\Y4 =
\Y5 =
\Y6 =

```

```

WINDOW
Xmin=0
Xmax=30
Xscl=1
Ymin=-230
Ymax=230
Yscl=1
Xres=1

```

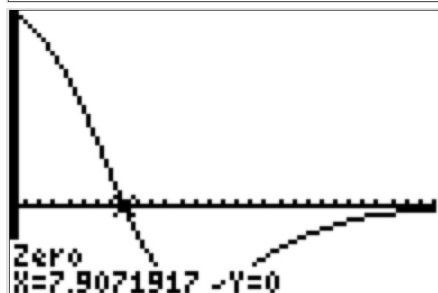
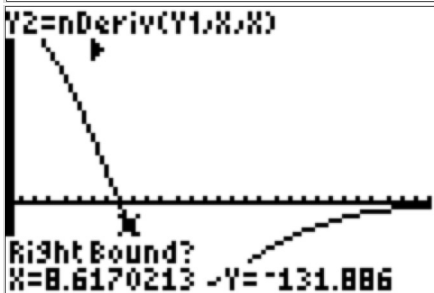
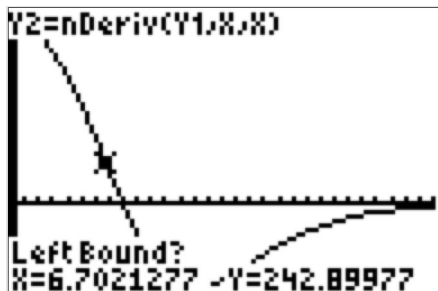
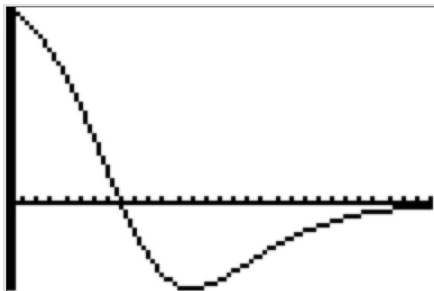
```

Zoom MEMORY
4: ZDecimal
5: ZSquare
6: ZStandard
7: ZTrig
8: ZInteger
9: ZoomStat
0: ZoomFit

```

Functions --> Window --> Zoom 0: ZoomFit

Test value  $Y_1(2) = 2182.79731$  to make sure you function is correct



2ed/Calc/Zero -- > Left bound -- > Right bound

## Solution for this example

The Demand Function  $D(x)$

$$D(x) = \frac{1263.36}{1 + 0.09e^{0.28x}}$$

The Revenue Function  $R(x)$

$$R(x) = xD(x) = \frac{1263.36x}{1 + 0.09e^{0.28x}}$$

Find the **price** which gives the **maximal** revenue.

Solution:

$$x = 7.9071917$$



**Find inflection point using TI-84 ClassPacket page49.**

The Demand Function  $D(x)$

$$D(x) = \frac{1263.36}{1 + 0.09e^{0.28x}}$$

**Q: Find the inflection point (x and y coordinates) for the Demand function.**

Method: We need to solve equation  $D''(x) = 0$ .

Step1:

$$D'(x) = -1263.36(1 + 0.09e^{0.28x})^{-2}(0.09e^{0.28x})(0.28)$$

Step2:  $Y1 = D'(x)$  and  $Y2 = nDeriv(Y1, X, X) = \frac{d}{dX}(Y1)|_{X=X}$

Step3: Set Window: Xmin=0 and Xmax=30

Step4: Zoom -- > 0:ZoomFit

Step5: 2nd/Calc/Zero

Step6: Left Bound, Right Bound

Step 7: X=8.5998057

Step 8: D(8.60)=631.662821

## Solution to question 2 in Quiz6 Review.

$$h(x) = -x^3 + 9x^2 - 30x + 20$$

**Question(a).** Find the inflection point of  $h(x)$ . Both x and y coordinates.

Solutions:

$$h'(x) = -3x^2 + 18x - 30$$

$$h''(x) = -6x + 18 = 0$$

$$x = 3$$

$$h(3) = -16$$

The inflection point of  $h(x)$  is (3,-16).

**Question(b).** Graph  $h(x)$  using TI-84 over interval  $-2 \leq x \leq 6$ .

Write down Window Setting.

Decide what kind of point it is (Fastest increase, Slowest increase...).

```
Plot1 Plot2 Plot3
Y1= X^3+9X^2-30X+
Y2=
Y3=
Y4=
Y5=
```

```
WINDOW
Xmin=-2
Xmax=6
Xscl=1
Ymin=-518.5753...
Ymax=1159.0458...
Yscl=1
Xres=1
```

Functions -- > Window



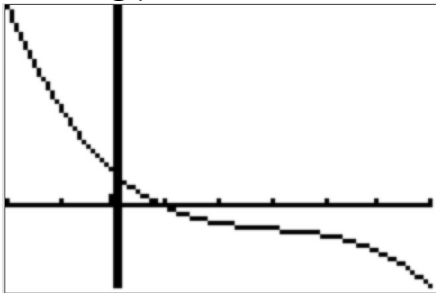
## Zoom 0: ZoomFit

The inflection point is the **slowest decreasing** point

```

000 MEMORY
4:ZDecimal
5:ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9:ZStat
0 ZoomFit

```



**Warning:** If you get an Error here.

**First,** check if you use (-) for negative.

**Second,** check if you have any data in STAT/EDIT/. If you don't have data here, put 0 in L1 and 1 in L2.

Press **Window** again. You will see the window setting:

```
WINDOW
Xmin=-2
Xmax=6
Xscl=1
Ymin=-52
Ymax=124
Yscl=1
↓Xres=1
```

Xmin=-2, Xmax=6, Ymin=-52, Ymax=124