Doing Functions Right in 1105/1033

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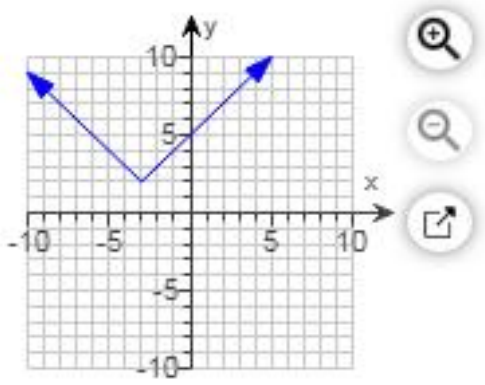
Current Situation in Blitzer, et. Al.

- Find range, domain of abstract functions
- Find max, min for arbitrary curves
- Example from MyLabsPlus: 2.1 #22 (1105)

Use the graph to determine the following.

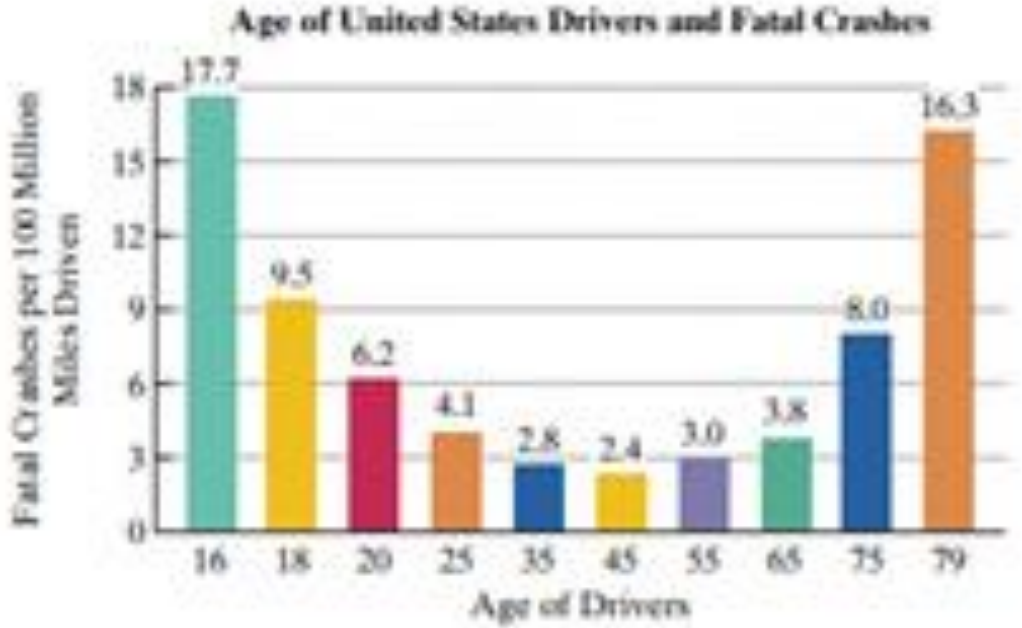
a. the function's domain
b. the function's range
c. the x-intercepts, if any
d. the y-intercept, if any
e. the function values, f(− 5) and f(0).

Assume that the graph of the function continues its trend beyond the displayed coordinate grid.



But a Regression Problem is Better

- Here's a problem where finding
  - The domain, the range
  - Max and mins
  - Are all pertinent and interesting, meaningful



A Regression Problem

- The TI-83/84 steps are to put the data points in
- Exam them and determine which model
  - Linear
  - Quadratic
  - Exponential
  - Logarithmic
- Resembles the data points
- Then generate the model and put it into Y_1
- Look at the curve versus the data points

Pertinent Questions

- The domain and range questions
  - Are answered with the data points
  - The domain, for example, are the min and max x's
  - The range, the min and max y's
- The max and min are of interest in the real world
- Interpolations are easy with the Table feature
- For the particular example: Is there a theory?
- What policies are appropriate? Etc.

This is New Technology Applied

- Students like using their calculators
- Calculators doing regression analysis gives
- Concreteness to the utility of functions
- Students with nursing majors, others
- See how pertinent questions can be answered
  - What happens to temperature of patient
  - Blood glucose with ingestion of food x
  - CO_2 ppm in the atmosphere and warming

Connection with Regular Algebra

- Once a quadratic is found for a phenomenon
- The max and min can be calculated using
- Regular algebra or a program

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PROGRAM:MAXMIN
:Prompt A,B,C
: -B/(2A)→H
:C-B²/(4A)→K
:Disp H▸Frac
:Disp K▸Frac
:
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Here's the derivation:

$$Ax^2 + Bx + C = 0$$

gives

$$x^2 + \frac{B}{A}x = -\frac{C}{A}.$$

Completing the square, we need

$$\left(\frac{1}{2}\frac{B}{A}\right)^2 = \frac{B^2}{4A^2}.$$

So:

$$x^2 + \frac{B}{A}x + \frac{B^2}{4A^2} = -\frac{C}{A} + \frac{B^2}{4A^2}$$

and thus

$$\left(x + \frac{B}{2A}\right)^2 = -\frac{C}{A} + \frac{B^2}{4A^2}$$

and multiplying by A and moving the right side to the left gives

$$A\left(x + \frac{B}{2A}\right)^2 + C - \frac{B^2}{4A} = 0.$$

So

$$H = -\frac{B}{2A} \text{ and } K = C - \frac{B^2}{4A}.$$

You Couldn't Do This Before

- My suggestion is that students who (one sentence)
- Learn functions using phenomena
- Modeled with their TI-83/84
- And even program their calculators to
- Convert algebra into programs
- Really appreciate and understand
- The utility of mathematics, functions in particular,
- And are well served in that jobs will ask
- Them to have a mathematical understanding
- Of their tasks supplemented by technology.
- Repetitive pencil and paper calculations?
- Are a relic of pre-calculator days.
- Do the algebra once, put it into a program.
- Algebra is pertinent: it shows the rules
- For making spreadsheets.