

College Algebra, Section 1.2, #50  
Graphs of Functions

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**Cocaine Use** The percent of high school seniors during the years 1975-2010 who have ever used cocaine can be described by

$$y = 0.0152x^2 - 0.9514x + 21.5818$$

where  $x$  is the number of years after 1975.<sup>1</sup>

You should first notice when and how  $x$  and  $y$  are defined.  $x$  stands for the number of years after 1975 and  $y$  represents the percent of high school seniors during the years 1975-2010 who have ever used cocaine.

**a.** What inputs correspond to the years 1975 through 2010?

$x = 0$  corresponds to 1975,  $x = 1$  to 1976, and so on until we get to 2010.

The time period 1975-2010 is represented by  $x = 0$  through  $x = 35$ .

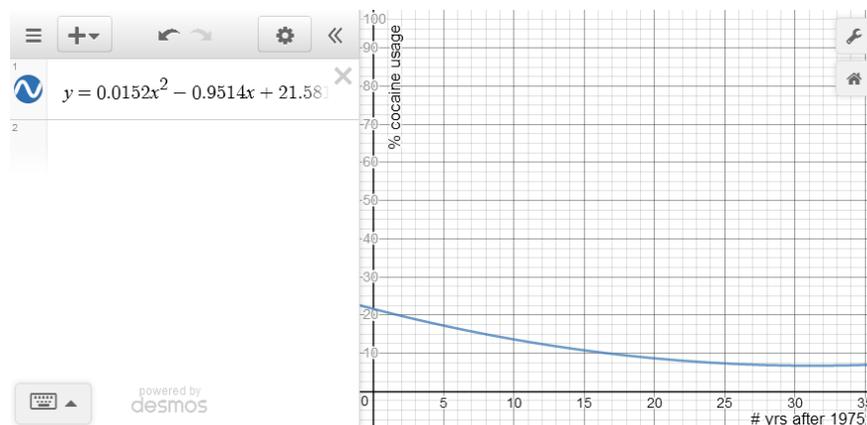
**b.** What outputs for  $y$  could be used to estimate the percent of seniors who have ever used cocaine?

The outputs, or  $y$  values, represent percentages. If there has been no cocaine usage, we have 0%. If all seniors have used cocaine, we have 100%.

So, outputs range from 0 to 100%.

**c.** Based on your answers to parts (a) and (b), choose an appropriate window and graph the equation on a graphing utility.

The window will include all possible values of  $x$  and  $y$ .



**d.** Graph the function again with a new window that gives a graph nearer the center of the screen.

Notice when  $x = 0$ , the  $y$ -value is a little less than 25. We can also see from the above graph that  $y$ -values of the function are decreasing as we move to the right.

To view this graph nearer to the center of the screen, we can ignore all  $y$ -values greater than 25 or so because the graph never reaches up that high when we are looking at  $x$ -values on the interval  $[0,35]$ .

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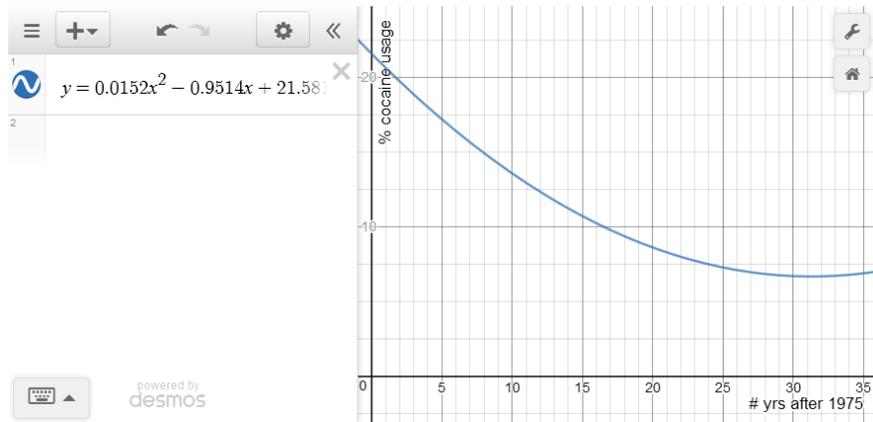
<sup>1</sup>Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 40, #50.

## College Algebra

### Graphs of Functions

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I've chosen  $x$ -values of  $[0,35]$  and  $y$ -values of  $[0,25]$  and the entire graph fits neatly in this window.



e. Use this function to estimate the percent in 2013.

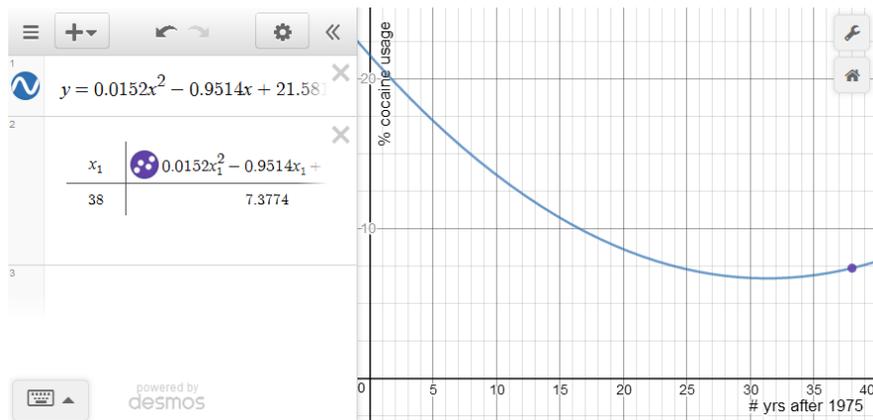
Because the difference between 2013 and 1975 is 38, the year 2013 corresponds to  $x = 38$ .

You have two choices... Either substitute  $x = 38$  into the function and solve for  $y$  OR find the  $y$ -value of the point on the graph corresponding to  $x = 38$ . We'll do both.

Here, we'll do the substitution and solve algebraically.

$$\begin{aligned}y &= 0.0152x^2 - 0.9514x + 21.5818 \\&= 0.0152(38)^2 - 0.9514(38) + 21.5818 \\&= 0.0152(1444) - 36.1532 + 21.5818 \\&= 21.9488 - 36.1532 + 21.5818 \\&= 7.3774\end{aligned}$$

And here's how it would look on the graph. I've enlarged the viewing window to include  $x = 38$ .



Last, remember to answer the question that was asked.

In 2013, 7.38% of high school seniors have, at some time, tried cocaine.