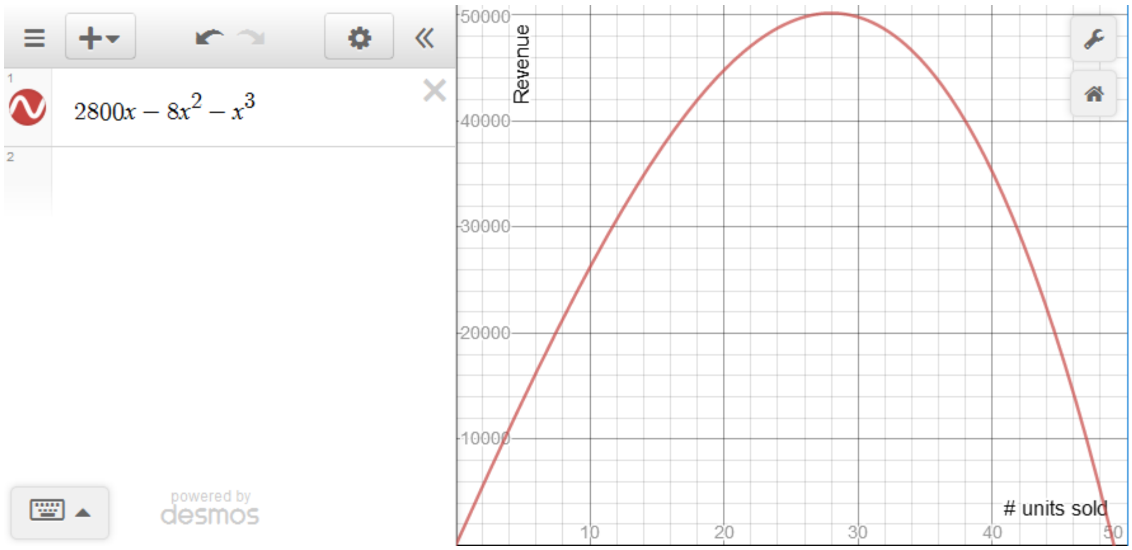
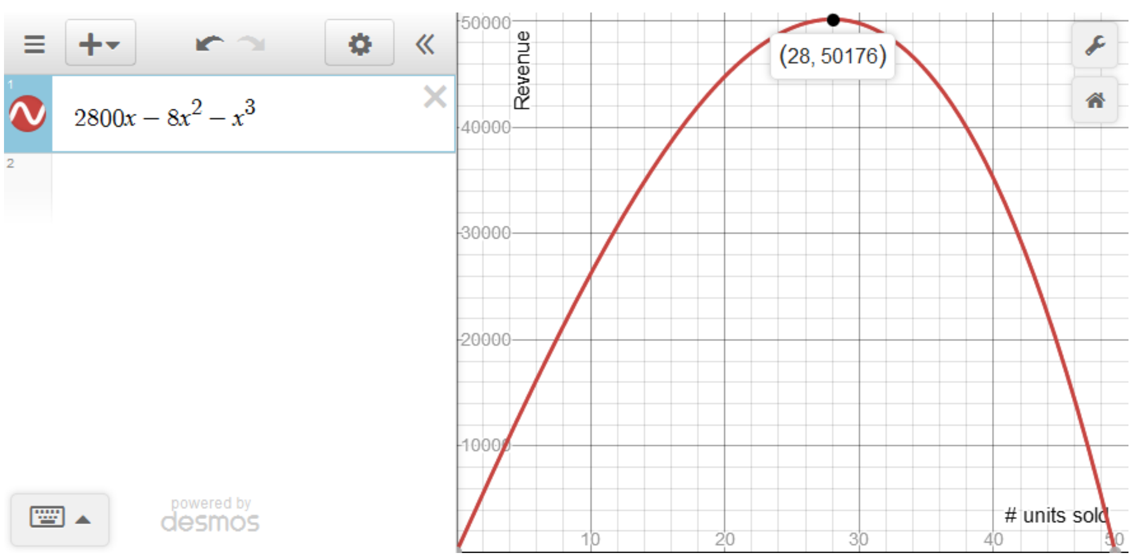
Weekly Revenue *A firm has total weekly revenue in dollars for its product given by* $R(x) = 2800x - 8x^2 - x^3$*, where* x *is the number of units sold.* [1]

a. *Graph this function on the window* $[0, 50]$ *by* $[0, 51{,}000]$.



b. *Use technology to find the maximum possible revenue and the number of units that gives the maximum revenue.*



The highest point on the graph gives the values for the maximum revenue and the number of units that will yield the maximum revenue.

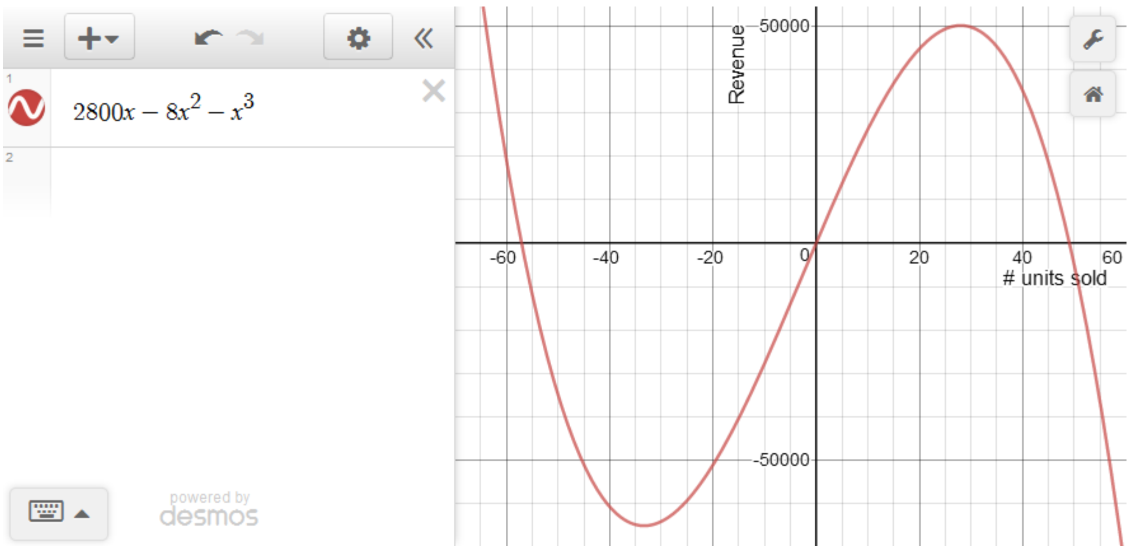
In the given window, we can see the apex of the graph at the point $(28, 50176)$. This point is in the form $(units, revenue)$ and this tells us that producing 28 units will give a maximum revenue of \$50,176.

[1]Harshbarger/Yocco, *College Algebra In Context, 5e*, p. 438, #40.

c. *Find a window that will show a complete graph — that is, will show all of the turning points and intercepts. Graph the function using this window.*

$R(x) = 2800x - 8x^2 - x^3$ is a cubic function with a negative leading coefficient. Because the function is cubic, we know that the graph will have a maximum of two turning points. Because the leading coefficient is negative, we know that the end behavior is up to the left and down to the right. We also know that the graph has AT MOST 3 x-intercepts.

As we reset the viewing window, we need to look for all of these behaviors.



It took a couple of guesses but I've settled on a viewing window of $[-70, 60]$ in the x-direction by $[-70{,}000, 55{,}000]$ in the y-direction. This window shows all three x-intercepts (the maximum number of x-intercepts that a cubic function can have), both turning points and the end behavior of the graph.

d. *Does the graph in part (a) or the graph in part (c) better represent the revenue from the sale of x units of a product?*

The graph in part (a) better represents the revenue from a sale of x units of a product because $x \geq 0$. This restriction is necessary because we cannot produce less than zero units of a product.

e. *Over what interval of x-values is the revenue increasing, if $x \geq 0$?*

Using the graph from part (b), we can see that the graph is increasing (going up as we move from left to right) from the value $x = 0$ until we get to the maximum, $x = 28$. To the right of $x = 28$ the graph is decreasing (going down).

The revenue is increasing in the interval $0 < x < 28$.