Zooming and finding intersection points

In this class we are going to be learning how to do calculus without the help of a calculator and also learn how to use a graphing calculator as a tool that will help us understand the calculus more deeply.

Let's find the intersection points of $y = x^2 + 4$ and $y = (x + 4)^2$.
First, let's graph the two functions.

- Type in the equations in the <u>Y=</u> menu. [*When you want to type in 'X', push the* <u>X,T,Θ,n</u> *button.*]

- Then press the <u>GRAPH</u> button.

You will see the two functions pictured in the standard view, where both the $x-$ and the $y-$ coordinates range from $[-10, 10]$.
Reality check: Which function is which?
Push the <u>WINDOW</u> button to see the specifics of the coordinate ranges.

At some times, it is useful to change your viewing window. You can either manually modify the ranges in the <u>WINDOW</u> menu, or use one of the zooming options in the <u>ZOOM</u> menu. Click on the <u>ZOOM</u> button.

- **6: Standard** — If at any point you wish to revert back to the $[-10, 10] \times [-10, 10]$ view, press 6.

- **4: Decimal** — I like this view the best. Each pixel now represents 0.1.

- **2: Zoom In** and **3: Zoom Out** — When you need to zoom in or out on the picture, select 2 or 3 and then push the <u>ENTER</u> button.

- **1: Box Zoom** — Use it like a magnifying glass to zoom in on a small area in graph view.

We'll see if we can figure out where the intersection point is. Do a decimal zoom. Now we can't see both graphs, so zoom out. [*Hit* <u>ZOOM</u>, *then* <u>3</u>, *then* <u>ENTER</u>, *We can see both curves.*]

Now use the tracing capabilities to follow the curves. Hit the <u>TRACE</u> button. The left and right arrow buttons change the x values and the up and down arrow buttons change the function along which you are tracing.

Practice tracing along both curves and figure out an x value very close to where the curves intersect. Then zoom in. Trace the curves again and figure out where the two curves intersect.

Intersection point: