Your friend is working on the following homework problem: $\displaystyle\int_{-1}^{1} \frac{1}{1+x^4}\, dx$.
She decides to write the integrand as

$$\int_{-1}^{1} \frac{1}{1+x^4}\, dx = \int_{-1}^{1} \frac{\frac{1}{x^4}}{1+\frac{1}{x^4}}\, dx$$

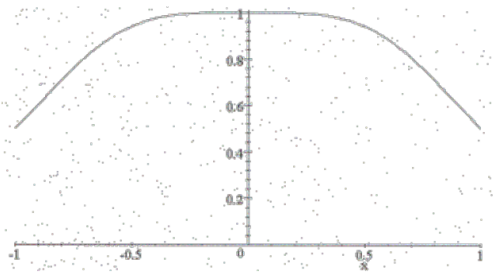
so that she can use substitution. The rest of her work is

Let $u = \frac{1}{x^4}$ do that $du = -\frac{4}{x^5}\, dx$. Then

$$\int_{-1}^{1} \frac{1}{x^4}\, dx = \int_{1}^{1} \frac{u}{u+1}\left(-\frac{u^{-5/4}}{4}\right)\, du$$

and this last integral is zero because the limits of integration are equal to each other. So $\displaystyle\int_{-1}^{1} \frac{1}{1+x^4}\, dx = 0$.

However, when you plot the integrand $\frac{1}{1+x^4}$, you get the following graph:



1. How can you tell from the graph that something went wrong with your friend's work?
2. Where did she make a mistake?