Even and Odd Functions

**Even function:** when \( f(-x) = f(x) \) a function is even.

**Odd function:** when \( f(-x) = -f(x) \) a function is odd.

**What does that mean?**

\( f(x) = x^2 + 2x + 2 \); solve for \( f(0) \)

We would then plug the 0 in for the \( x' \)s in the \( f(x) \) equation: \( 0 + 0 + 2 = 2 \), so \( f(0) = 2 \)

Now let’s apply that to the even/odd function information.

\( f(x) = x^2 + 2x + 2 \), let’s plug in \((-x)\), as listed for the even function, for the \( x' \)s and see what we get:

\[ (-x)^2 + 2(-x) + 2 = x^2 - 2x + 2 \]

Evaluate the answer

**Even evaluation, does \( f(-x) = f(x) \)?**

\[ x^2 - 2x + 2 \neq x^2 + 2x + 2 \]

We have two different symbols so this equation is not an even function.

**Odd evaluation, does \( f(-x) = -f(x) \)?**

We know that \( f(-x) \) is \( x^2 - 2x + 2 \).

Now let’s look at the other side of the evaluation.

\(-f(x)\) means that the entire function needs to be multiplied by -1.

When you see \(-f(x)\) for this example, it means:

\[ -(x^2 + 2x + 2) = -x^2 - 2x - 2 \]

When we see \(-f(x)\) it means that we reverse each symbol in our equation. **It’s an opposite!**

So, does \( f(-x) = -f(x) \)

\[ x^2 - 2x + 2 \neq -x^2 - 2x - 2 \]

We have different symbols again, so this equation is **not** an odd function.