# Math 170: Quiz 2

## Sayan Mukherjee's discussion

### January 28, 2021

**Problem 1.** Find the following definite integral:

$$\int_{-4}^{4} (x^{13} - x^7 + x^3)\, dx$$

*Solution.* As $x^{13}, x^7, x^3$ are all *odd* functions, $\int_{-4}^{4} x^{13}\, dx = \int_{-4}^{4} x^7\, dx = \int_{-4}^{4} x^3\, dx = 0$, and therefore

$$\int_{-4}^{4} (x^{13} - x^7 + x^3)\, dx = 0.$$

$\square$

*Alternate Solution.* We know antiderivative of $x^{13} - x^7 + x^3$ is $\frac{x^{14}}{14} - \frac{x^8}{8} + \frac{x^4}{4}$. Thus,

$$\int_{-4}^{4} (x^{13} - x^7 + x^3)\, dx = \left( \frac{4^{14}}{14} - \frac{4^8}{8} + \frac{4^4}{4} \right) - \left( \frac{(-4)^{14}}{14} - \frac{(-4)^8}{8} + \frac{(-4)^4}{4} \right).$$

As $(-4)^{14} = 4^{14}$ and $(-4)^8 = 4^8$ and $(-4)^4 = 4^4$, the individual terms cancel off to give 0.

$\square$

*Rubric.*

- +4 for correct answer

- +1 for correct explanation (odd powers / odd function)

OR,

- +3 points for correct antiderivative

- +1 point for correct expression after plugging in

- +1 point for correct answer