**question** 2 views

# Daily Challenge 18.2

(**Due: Tuesday 11/13 at 12:00 noon Eastern**)

Reminder: since we will be preparing for Splash this week, I will post much shorter *exercises* (rather than problems/challenges) for the week of 11/12 to 11/19. Each of these should take 5-10 minutes.

This should leave you more time to finish slides and to catch up on other challenges. I still expect you to finish any overdue DCs before working on these easier ones, and to keep up on these exercise DCs, even while traveling and at Splash.

## (1) Exercise: area between curves

Find the area of the region between the graphs of $f(x) = x^2$ and $g(x) = -x^2$ and the vertical lines through $(-1, 0)$ and $(1, 0)$.

[Hint: **the answer is not zero**. When we say "between" two graphs, we mean the integral of the upper function minus the integral of the lower function. This always gives a non-negative result, even though the individual integrals we are subtracting each give a signed area.]

daily_challenge

Updated 5 months ago by Christian Ferko

**the students' answer,** *where students collectively construct a single answer*

The hint tells us to find the integral of the upper function minus the integral of the lower function on $(-1, 1)$; We see that the "anti-derivative" of $f$ is $\frac{1}{3}x^3$, and similarly that of $g$ is $-\frac{1}{3}x^3$; we see by applying the sophomores FTC that

$$\int_{-1}^{1} f = \frac{1}{3}(1)^3 - \frac{1}{3}(-1)^3 = \frac{1}{3} - \frac{-1}{3} = \frac{2}{3},$$

and

$$\int_{-1}^{1} g = -\frac{1}{3}(1)^3 - -\frac{1}{3}(-1)^3 = \frac{-1}{3} - \frac{1}{3} = \frac{-2}{3},$$

so $\int_{-1}^{1} f - \int_{-1}^{1} g = \frac{4}{3}$:wow:

Updated 4 months ago by Logan Pachulski

**the instructors' answer,** *where instructors collectively construct a single answer*

The area is

$$\int_{-1}^{1} \left(x^2 - (-x^2)\right)\, dx = 2\left[\frac{x^3}{3}\right]_{-1}^{1} = \frac{2}{3}\left((1^3) - (-1)^3\right) = \frac{4}{3}.$$

Updated 4 months ago by Christian Ferko

**followup discussions** *for lingering questions and comments*