question

Daily Challenge 18.3

(**Due: Wednesday 11/14 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.

I expect you to remain caught up on DCs throughout 11/19.

(1) Exercise: a composition of functions.

Let

$$F(x) = \int_a^{x^3} \sin^3(t)\, dt.$$

Find $F'(x)$ by writing this a composition of functions and applying the chain rule, as we did in session 44.

[Hint: let $B(x) = x^3$ and $C(x) = \int_a^x \sin^3(t)\, dt$. How is F related to B and C?]

daily_challenge

Updated 5 months ago by Christian Ferko

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

Let $B(x) = x^3$ and $C(x) = \int_a^x \sin^3(t)dt$, then note that $F(x) = C(B(x))$, and take the derivative of each side and see $F'(x) = C'(B(x)) \cdot B'(x) = \sin^3(x^3) \cdot 3x^2$

Updated 4 months ago by Logan Pachulski

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

Following the hint, let $B(x) = x^3$ and $C(x) = \int_a^x \sin^3(t)\, dt$. Then

$$F(x) = \int_a^{x^3} \sin^3(t)\, dt = C(B(x)).$$

Differentiating, we have

$$F'(x) = C'(B(x)) \cdot B'(x) = \sin^3(x^3) \cdot 3x^2,$$

where we have used the FTC in the last step. Thus $F'(x) = 3x^2 \sin^3(x^3)$.

Updated 4 months ago by Christian Ferko

followup discussions *for lingering questions and comments*