

## Break-Ground:

# More coffee

*Two young mathematicians witness the perils of drinking too much coffee.*

Check out this dialogue between two calculus students (based on a true story):

**Devyn:** Riley!

**Riley:** Yes Devyn?

**Devyn:** Do you like coffee? I like coffee! Sometimes I feel really “bad,” sluggish and tired. Then I drink coffee and I feel good! Sometimes I drink a lot of coffee!

**Riley:** Um?

**Devyn:** But here’s the problem, see: If I drink too much, I become over excited and can’t stop talking. I just drink coffee, then talk. Then drink more coffee. Then I start to feel sick. Ugh. I have a love-hate relationship with coffee. Unless I drink just the right amount! Then it’s a love relationship.

**Riley:** If only there were a calculus solution to this problem!

Remember, calculus is about studying functions. If we can “see” a function in the work above, maybe we can figure out how to solve Devyn’s problem (of finding the right amount of coffee to drink).

**Problem 1** *If we were to try to solve Devyn’s coffee problem, what would be the best function to know?*

### Multiple Choice:

- (a) *How many donuts Devyn eats.*
- (b) *How “good” Devyn feels after  $x$  cups of coffee. ✓*
- (c) *How many cups of coffee Devyn drinks when Devyn feels  $x$  “good.”*
- (d) *Impossible to say.*

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Learning outcomes: Identify situations in which an absolute maximum or minimum is guaranteed.

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**Problem 2** If we let  $f(x)$  be “How ‘good’ Devyn feels after  $x$  cups of coffee.” And we think about what Devyn says above, is there an amount Devyn can drink and feel maximally “good?”

**Multiple Choice:**

- (a) yes ✓
- (b) no

**Feedback (attempt):** “Yes” is probably the best answer, though we are assuming that Devyn feels “bad” without enough coffee, “good” with some, and “bad” again with the function continuously growing and then decreasing.

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