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.*

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

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.*