

**Break-Ground:**

## A mysterious formula

*Two young mathematicians discuss optimization from an abstract point of view.*

Check out this dialogue between two calculus students:

**Devyn:** Riley, what do you think is the maximum value of

$$f(x) = \frac{10}{x^2 - 2.8x + 3}?$$

**Riley:** Where did that function come from?

**Devyn:** It's just some, um, random function.

**Riley:** Wait, does this have to do with coffee?

**Devyn:** Um, uh, no?

**Riley:** Well what interval are we on?

**Devyn:** Let's say  $[0, 10]$ , I mean there's no way I could possibly drink ten cups of coff. . .

**Riley:** I knew this was about coffee.

Here Devyn has made a function, that is supposed to record Devyn's "well-being" with respect to the number of cups of coffee consumed in one day.

**Problem 1** Graph Devyn's function. Where do you estimate the maximum on the interval  $[0, 10]$  to be? The maximum is at  $x = \boxed{1.4}$

**Problem 2** If you wanted to argue that this is the (global) maximum value on  $[0, 10]$  without plotting, what arguments could you use?

**Free Response:**

---

Learning outcomes: Solve optimization problems by finding the appropriate extreme values.