

4. [12 points] In preparation for the holidays, a local bookstore is planning to sell mugs of a variety of shapes. Suppose that the amount of liquid in a “UM” mug if filled to a depth of h cm is $L(h) = Uh(3M^2 - 3Mh + h^2)$ cm³ for $U, M > 0$.

a. [4 points] Find and classify any critical points of L on the interval $(0, 5M)$.

b. [2 points] Determine any points of inflection of L on the interval $(0, 5M)$.

c. [6 points] Suppose you are pouring coffee into a “UM” mug at a rate of 15 cm³ per second. At what rate is the depth of the coffee in the mug changing when the coffee reaches a depth of 4 cm in the mug?