

Algebra about Math 1C

Question 9.

The average value of  $f(x) = x^2 + x + 1$  at  $[0, b]$  is

$$f_{\text{avg}} = 10 = \frac{\int_0^b (x^2 + x + 1) dx}{b}, \text{ note that we can safely assume that } b > 0$$

$$= \frac{\left. \frac{x^3}{3} + \frac{x^2}{2} + x \right|_0^b}{b}$$

$$= \frac{\left( \frac{b^3}{3} + \frac{b^2}{2} + b \right) - 0}{b}$$

$$10 = \frac{b^2}{3} + \frac{b}{2} + 1$$

$$6 \left[ 0 = \frac{1}{3} b^2 + \frac{1}{2} b - 9 \right] 6$$

$$0 = 2b^2 + 3b - 54$$

$$0 = (2b - 9)(b + 6)$$

$$b = \frac{9}{2}, -6$$

$b = -6$  is an erroneous solution because we established that  $b > 0$

$$\boxed{\therefore b = \frac{9}{2}}$$