

8. [16 points] An apple farmer starts harvesting apples on her orchard. They start collecting apples at 6 am. Let  $a(t)$  be the total amount of apples (in hundreds of pounds) that have been harvest  $t$  hours after 6 am. Some of the values of the invertible function  $a(t)$ , its derivative  $a'(t)$  and an antiderivative function  $b(t)$  are shown below.

$t$	3	4.5	6	7.5	9	10.5	12
$a(t)$	1.5	2	3	4.5	6	6.5	9

$t$	3	6	9	12	$t$	3	6	9	12
$a'(t)$	0.4	1.2	0.5	1.8	$b(t)$	6	12.5	25.5	43

- a. [2 points] Use the tables to estimate the value of  $a''(9)$ . Show your work.

**Answer:**  $a''(9) \approx$  \_\_\_\_\_

- b. [3 points] Find the value of  $(a^{-1})'(6)$ . What are its units in the context of this problem?

**Answer:**  $(a^{-1})'(6) =$  \_\_\_\_\_ **Units:** \_\_\_\_\_

- c. [3 points] Use the fact that  $a'(10) = 3.2$  to complete the sentence below, including units, to give a practical interpretation in the context of this problem that can be understood by someone who knows no calculus.

*The amount of apples harvested between 4 pm and 4:30 pm ...*

- d. [3 points] Find the tangent line approximation  $S(t)$  of  $b(t)$  near  $t = 3$ .

**Answer:**  $S(t) =$  \_\_\_\_\_

- e. [2 points] Use your answer in **d** to approximate the value of  $b(2)$ .

**Answer:**  $b(2) \approx$  \_\_\_\_\_

- f. [1 point] Is your answer in **e** an overestimate or an underestimate? Circle your answer.

OVERESTIMATE

UNDERESTIMATE

NOT ENOUGH INFO

- g. [2 points] Let  $m(t)$  be an antiderivative of  $a(t)$  satisfying  $m(9) = -1$ . Find  $m(3)$ .

$m(3) =$  \_\_\_\_\_