Derivatives from a table

2015 BC3

1. Johanna jogs along a straight path. For $0 \le t \le 40$. Johanna's velocity is given by a differentiable function v. Selected values of v(t), where t is measured in minutes and v(t) is measured in meters per minute, are given in the table.

t (minutes)	0	12	20	24	40
$v(t)$ (meters per minute)	0	200	240	–220	150

a) Use the data in the table to estimate the value of $v'(16)$.

2014 BC 4

t (minutes)	0	2	5	8	12
$v_A(t)$ (meters/min)	0	100	40	-120	-150

4. Train A runs back and forth on an east-west section of railroad track. Train A's velocity, measured in meters per minute, is given by a differentiable function $v_A(t)$, where time t is measured in minutes. Selected values for $v_A(t)$ are given in the table above.

a) Find the average acceleration of train A over the interval $2 \le t \le 8$.

2013 BC3

Hot water is dripping through a coffeemaker, filling a large cup with coffee. The amount of coffee in the cup at time t, $0 \le t \le 6$, is given by a differentiable function C, where t is measured in minutes. Selected values of C(t), measured in ounces, are given in the table.

t(minutes)	0	1	2	3	4	5	6
C(t) ounces	0	5.3	8.8	11.2	12.8	13.8	14.5

a) Use the data in the table to approximate $C'(3.5)$. Show the computations that lead to your answer, and indicate units of measure.

2011 #2

t(minutes)	0	2	5	9	10
H(t) degrees C	66	60	52	44	43

As a pot of tea cools, the temperature of the tea is modeled by a differentiable function H for $0 \le t \le 10$, where time t is measured in minutes and temperature H(t) is measured in degrees Celsius. Values of H(t) at selected values of time t are shown in the table above

Use the data in the table to approximate the rate at which the temperature of the tea is changing at time t = 3.5. Show the computations that lead to your answer.

2012 #4

The function f is twice differentiable for x > 0 with f(1) = 15 and $f''(1) = 20$. Values f', the derivative of f, are given for selected values of x in the table.

x	1	1.1	1.2	1.3	1.4
$f'(x)$	8	10	12	13	14.5

a) Write an equation for the line tangent to the graph of f at x = 1. Use this line to approximate f(1.4).

2012 #1

t(minutes)	0	4	9	15	20
W(t) degrees F	55.0	57.1	61.8	67.9	71.0

The temperature of water in a tub at time t is modeled by a strictly increasing, twice differentiable function, W, where W(t) is measured in degrees Fahrenheit and t is measured in minutes. At time t = 0, the temperature of the water is 55° F. The water is heated for 30 minutes, beginning at time t = 0. Values of W(t) at selected times t for the first 20 minutes are given in the table above.

a) Use the data in the table to estimate $W'(12)$. Show the computations that lead to your answer. Using correct units, interpret the meaning of your answer in the context of this problem.

2010 #2

A zoo sponsored a one-day contest to name a new baby elephant. Zoo visitors deposited entries in a special box between noon (t=0) and 8 P.M. (t=8). The number of entries in the box t hours after noon is modeled by a differentiable function E for $0 \le t \le 8$. Values of E(T), in hundreds of entries, at various times t are shown in the table.

t(hours)	0	2	5	7	8
E(t) (hundreds of entries)	0	4	13	21	23

b) Use the data in the table to approximate the rate in hundreds of entries per hour, at which entries were being deposited at time t = 6. Show the computations that lead to your answer.

2009 #5

Let f be a function that is twice differentiable for all real numbers. The table gives values of f for selected points in the closed interval $2 \le x \le 13$.

x	2	3	5	8	13
f(x)	1	4	-2	3	6

Estimate $f'(4)$. Show the work that leads to your answer.