1. (3 pts) The temperature, H, in degrees Celsius, of a cup of coffee placed on the kitchen counter is given by $H = f(t)$, where t is in minutes since the coffee was put on the counter.

(a) Is $f'(t)$ positive or negative? ?

(Be sure that you are able to give a reason for your answer.)

(b) What are the units of $f'(20)$? _____

(see the **units** cribsheet for correct units notation)

Suppose that $|f'(20)| = 0.9$ and $f(20) = 57$. Fill in the blanks (including units where needed) and select the appropriate terms to complete the following statement about the temperature of the coffee in this case.

At ___ minutes after the coffee was put on the counter, its ? is _____ and will ? by about _____ in the next 45 seconds.

Answer(s) submitted:

-
-
-
-
-
-
-

(incorrect)

---

2. (2 pts) The cost, C (in dollars) to produce g gallons of ice cream can be expressed as $C = f(g)$.

(a) In the expression $f(300) = 400$,
what are the units of 300? _____
what are the units of 400? _____

(b) In the expression $f'(300) = 1.6$,
what are the units of 300? _____
what are the units of 1.6? _____

(Be sure that you can carefully put into words the meanings of each of these statement in terms of ice cream.)

Answer(s) submitted:

-
-
-
-

(incorrect)

---

3. (3 pts) A laboratory study investigating the relationship between diet and weight in adult humans found that the weight of a subject, W, in pounds, was a function, $W = f(c)$, of the average number of Calories per day, c, consumed by the subject.

(a) In the statement $f(1600) = 165$
what are the units of 1600? _____
what are the units of 165? _____
(include **units**)

(Think about what this statement means in terms of the weight of the subject and the number of calories that the subject consumes.)

(b) In the statement $f'(2000) = 0$,
what are the units of 2000? _____
what are the units of 0? _____
(include **units**)

(Think about what this statement means in terms of the weight of the subject and the number of calories that the subject consumes.)

(c) In the statement $f^{-1}(175) = 2300$,
what are the units of 175? _____
what are the units of 2300? _____
(include **units**)

(Think about what this statement means in terms of the weight of the subject and the number of calories that the subject consumes.)

(d) What are the units of $f'(c) = dW/dc$? _____
(include **units**)

Answer(s) submitted:

-
-
-
-
-
-
-

(incorrect)

---

4. (2 pts) Let $f(t)$ be the number of centimeters of rainfall that has fallen since midnight, where t is the time in hours. Match the following statements to their interpretations, given below.

(a) $f(9) = 2.6$: ?
(b) $f^{-1}(5) = 10$: ?
(c) $f'(9) = 0.1$: ?
(d) $(f^{-1})'(5) = 4$: ?

Interpretations:

1: when 5 centimeters of rain have fallen, it is accumulating at a rate of 1/4 cm/hr
2: when 4 centimeters have fallen, rain is accumulating at a rate of 1/5 hr/cm
3: at 10 hours after midnight, rain is falling at a rate of 5 cm/hr
4: 0.1 centimeters of rain have fallen 9 hours after midnight
5: at 9 hours after midnight, 0.1 centimeters of rain have fallen
6: at 4 hours after midnight, rain is falling at a rate of 5 cm/hr
7: at 5 hours after midnight, 10 centimeters of rain have fallen
8: at 9 AM, rain is falling at a rate of 2.6 cm/hr
9: at 5 hours after midnight, rain is falling at a rate of 4 cm/hr

10: when 4 centimeters of rain have fallen, rain is falling at a rate of 5 cm/hr
11: at 9 AM, 2.6 centimeters of rain have fallen
12: at 2.6 hours past midnight, 9 centimeters of rain have fallen
13: at 9 AM, the rain is falling at a rate of 0.1 cm/hr
14: 5 centimeters of rain have fallen 10 hours after midnight
15: when 4 centimeters have fallen, rain is accumulating at a rate of 1/5 cm/hr
16: at 0.1 hours after midnight, rain is falling at a rate of 9 cm/hr

Answer(s) submitted:

-
-
-
-

(incorrect)

---

5. (2 pts) The displacement (in meters) of a particle moving in a straight line is given by

$$s = t^2 - 6t + 16,$$

where t is measured in seconds.

(A)
(i) Find the average velocity over the time interval [3,4].
Average Velocity = _____
(ii) Find the average velocity over the time interval [3.5,4].
Average Velocity = _____
(iii) Find the average velocity over the time interval [4,5].
Average Velocity = _____
(iv) Find the average velocity over the time interval [4,4.5].
Average Velocity = _____

(B) Find the instantaneous velocity when $t = 4$.
Instantaneous velocity = _____

Answer(s) submitted:

-
-
-
-
-

(incorrect)

---

6. (2 pts) The cost (in dollars) of producing x units of a certain commodity is

$$C(x) = 6500 + 9x + 0.5x^2.$$

(a) Find the average rate of change of C with respect to x when the production level is changed
(i) from $x = 100$ to $x = 105$.
Average rate of change = _____
(ii) from $x = 100$ to $x = 101$.
Average rate of change = _____

(b) Find the instantaneous rate of change of C with respect to x when $x = 100$. (This is called the marginal cost.)
Instantaneous rate of change = _____

Answer(s) submitted:

-
-
-

(incorrect)