This writeup would probably get a grade of 4. There are no mathematical errors, and some of the work is good, but there are significant writing and style issues.

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MTH 201-02
Solution for Section 1.1, Exercise 1

A bungee jumper dives from a tower at time $t = 0$. Her height h (measured in feet) at time t (in seconds) is given by the graph in Figure 1.3 on page 7 of the textbook and by the function $s(t) = 100\cos(0.75t) \cdot e^{-0.2t} + 100$.

(a) What is the change in vertical position of the bungee jumper between $t = 0$ and $t = 15$?

Solution:

$$\begin{aligned} s(15) - s(0) &= (100\cos(0.75 \cdot 15) \cdot e^{-0.2 \cdot 15} + 100) - (100\cos(0.75 \cdot 0) \cdot e^{-0.2 \cdot 0} + 100) \\ &= (100\cos(11.25) \cdot e^{-3} + 100) - (100\cos(0) \cdot e^{0} + 100) \\ &= (100\cos(11.25) \cdot e^{-3} + 100) - (100 \cdot 1 \cdot 1 + 100) \\ &= (100\cos(11.25) \cdot e^{-3} + 100) - (100 \cdot 1 \cdot 1 + 100) \\ &= (100\cos(11.25) \cdot e^{-3} + 100) - 200 \\ &\approx -94.7469 \text{ feet} \end{aligned}$$

Correct math, but no setup or explanation. Also should lose the negative sign in the answer.

(b) Estimate the jumper's average velocity on each of the following time intervals: $[0, 15]$, $[0, 2]$, $[1, 6]$, and $[8, 10]$. Include units on your answers.

Solution: For each interval $[a, b]$, we calculate the change in distance $s(b) - s(a)$ divided by the change in time $b - a = \frac{-94.7469}{15-0} = -6.58313$.

Don't use = after $b - a$ because the fraction to the right of the equals sign is not equal to $b - a$. Also show more work in setting up the calculation, and use $\approx$ rather than $=$ for the final equality.

Note: The work for $s(15) - s(0)$ is done in part (a). The computations for the remaining intervals proceed similarly:

$$\text{Average velocity on [0,2]} = \frac{s(2) - s(0)}{2 - 0} = \frac{-95.2583}{2} \approx -47.6292$$

$$\text{Average velocity on [1,6]} = \frac{s(6) - s(1)}{6 - 1} = \frac{-66.2547}{2} \approx -13.2509$$

$$\text{Average velocity on [8,10]} = \frac{s(10) - s(8)}{10 - 8} = \frac{-14.6943}{2} \approx -7.3472$$

Better job of setup/explanation but no units on the answers.

(c) On what time interval(s) do you think the bungee jumper achieves her greatest average velocity? Why?

Solution: The greatest average velocity would occur on the interval where the distance changes the most over the shortest period of time. From the graph, this appears to be the interval $[0, 4]$.

(d) Estimate the jumper's instantaneous velocity at $t = 5$. Show your work and explain your reasoning, and include units on your answer.

Solution: We can get the instantaneous velocities by plugging in values near 5 to the equation $\frac{s(a+h)-s(a)}{h}$

Value of h	Average velocity from $t = 5$ to $t = 5 + h$
0.1	22.2523 feet per second
0.01	21.8543 feet per second

The I.V. is 21.8543.

There's really not enough data in this table to draw a reasonable conclusion about the instantaneous velocity yet; add 2–3 more rows. Also, spell out "instantaneous velocity" rather than use an abbreviation.

"Plug in" is slang; use "evaluate" instead

The fraction here is not an equation; use "expression" instead. Also there is no punctuation ending the sentence and the fraction should be multi-level

(e) Among the average and instantaneous velocities you computed in earlier questions, which are positive and which are negative? What does negative velocity indicate?

Solution: All of the average velocities in part (b) were negative, while the instantaneous velocity in part (d) was positive. The negative velocity indicates a downward motion.

Writer doesn't explain WHY the negative velocity should indicate downward motion. Note that the problem does not explicitly ask for this explanation, but correct explanations should always explain WHY even if not explicitly prompted.