2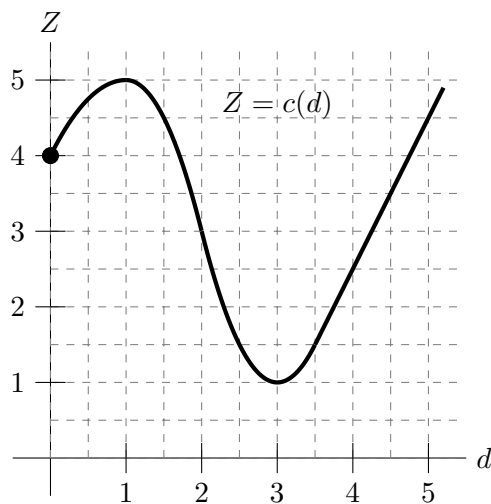. [11 points] In Townsville, USA, a vat of Chemical Z is spilled into Lake Townsville. Let $c(d)$ be the concentration of Chemical Z (in mg/L) at a depth of d meters below the surface in Lake Townsville. Assume that $c(d)$ is differentiable for $0 < d < 5$. A portion of the graph of $Z = c(d)$ is shown below.

a. [1 point] What is the concentration (in mg/L) of Chemical Z at the surface of Lake Townsville?

Answer: _____4_____

b. [2 points] Circle <u>all</u> of the intervals below for which $c'(d)$ is positive over the entire interval. Circle NONE if there are no such intervals.

$\boxed{0.2 < d < 0.8}$ $1.2 < d < 1.8$ $2.2 < d < 2.8$ $\boxed{3.2 < d < 3.8}$ $\boxed{4.2 < d < 4.8}$ NONE

c. [3 points] What is the average rate of change of the concentration of Chemical Z over the interval from $d = 1$ to $d = 3$? *Remember to include units.*

Solution: $\frac{(1-5)\,\text{mg/L}}{(3-1)\,\text{m}} = -2\,(\text{mg/L})/\text{m}$

Answer: _____$-2\ (\textbf{mg/L})/\textbf{m}$_____

d. [2 points] Suppose that $c(d)$ is linear for $3.5 < d < 5$. Find $c'(3.5)$.

Answer: _____2_____

e. [3 points] Using your answer to part (d), circle the appropriate choice and fill in the blank in the sentence below. *Remember to include units.*

Answer: If we go from a depth of 3.500 meters to a depth of 3.498 meters below the surface of Lake Townsville, the concentration of Chemical Z will

(circle one)   INCREASE $\boxed{\text{DECREASE}}$

by approximately _____$0.004\ \textbf{mg/L}$_____.