1. The quantity of oxygen that can dissolve in water depends on the temperature of the water (so thermal pollution influences the oxygen content of water). The graph shows how oxygen solubility $S$ varies as a function of the water temperature $T$.

(a) What is the meaning of the derivative $S'(T)$? What are its units?

The rate at which the solubility changes with respect to the water temperature. Units: \( \text{mg/L}^{\circ\text{F}} \) or \( \text{mg/L per } \circ\text{F} \)

(b) Estimate the value of $S'(24)$ and interpret it within the context of this problem. For full credit, be sure to show your work - including any slope calculations or any drawings on the graph that you used in your calculations.

$S'(24) \approx -0.25$

will also accept values in the interval $[-0.375, -0.1875]$

This is the instantaneous rate of change of oxygen solubility at 24\(^\circ\text{F}\). Or, how fast solubility is changing at 24\(^\circ\text{F}\).

Or, At 24\(^\circ\text{F}\), solubility is changing at a rate of \(-0.2 - \text{mg/L per } \circ\text{F} \)
3. Use the graph of $g(x)$ below to answer the following questions.

(a) On the graph of $g(x)$, label the following quantities. In addition, provide a brief description of quantities (i), (ii), (iii), (iv), and (v) [For example: $g(b)$ is the value of the function $g$ when evaluated at $x = b$].

When labeling on the graph, be sure to put $x$-values and $y$-values on their appropriate axes.

i. $g(b)$ The function value (or $g$-value) when $x = b$.

ii. $b + h$ An $x$-value near $b$ but not equal to $b$. (Note: could be to the left or right of $b$)

iii. $h$ The distance between the $x$-values $b$ and $b + h$

iv. $g(b + h)$ The function value (or $g$-value) when $x = b + h$

v. $\frac{g(b + h) - g(b)}{h}$ The slope of the line through the points $(b, g(b))$ and $(b + h, g(b + h))$

vi. The line containing the points $(b, g(b))$ and $(b + h, g(b + h))$

vii. The line tangent to $g(x)$ at the point $x = b$

(b) The slope of the line you drew for vi. above has positive / negative (circle one) slope.

(c) Fill-in-the-Blank with the letter that represents the correct word or phrase:

(A) average  
(B) instantaneous  
(C) at the point $x = b$  
(D) through the points $(b, g(b))$ and $(b + h, g(b + h))$

$\frac{g(b + h) - g(b)}{h}$ represents the $\underline{A}$ rate of change of $g(x)$ $\underline{D}$.

$\lim_{h \to 0} \frac{g(b + h) - g(b)}{h}$ represents the $\underline{B}$ rate of change of $g(x)$ $\underline{C}$.