Instantaneous Rate of Change

**Directions:** Below is a graph of \( f(x) = 0.5x^3 - x \)

For each value of \( x \), do the following:

a) Draw a tangent line at the point, then use the slope of the tangent line to estimate the instantaneous rate of change.

b) Use the “forwards-backwards” method (go forward 0.1 and backward 0.1) to estimate the instantaneous rate of change at \( x \).

c) Use the derivative formula \( \lim_{h \to 0} \frac{f(a + h) - f(a)}{h} \) to compute the exact instantaneous rate of change.

(note: for each point, I’m asking you to do the same thing three different ways! \( f'(x) \), instantaneous rate of change, and derivative of \( f(x) \) all have the same meaning)

1) \( x = -2 \)
2) \( x = -1 \)
3) \( x = 0 \)
4) \( x = 1 \)