MATH 201                    Your name: _____

**Learning targets DF1 and DFa, version 2**

Arapaho Glacier is a mountain glacier in Roosevelt National Forest, west of Boulder, CO. The following table[1] gives the surface area, $A(t)$, in square meters, of Arapaho Glacier in the year $t$.

| $t$ | 1900 | 1960 | 1973 | 1999 |
|---|---|---|---|---|
| $A(t)$ | 338,282 | 250,764 | 225,000 | 162,027 |

1. Compute an approximation for $A'(1960)$, and **include units** for this number.
   Write a sentence explaining what the number means about how the area of the glacier is changing.
   **Don't say "per," and don't say "rate."**

2. Compute an approximation for $A'(1999)$, and **include units** for this number.
   Do you think your approximation is too high or too low? Why?

3. How does $A'(1960)$ compare to $A'(1999)$? Is that good or bad?

[1]Haugen, B., Scambos, T., Pfeffer, T., & Anderson, R. (2010). Twentieth-century changes in the thickness and extent of Arapaho Glacier, Front Range, Colorado. *Arctic, Antarctic, and Alpine Research, 42*(2), 198-209.
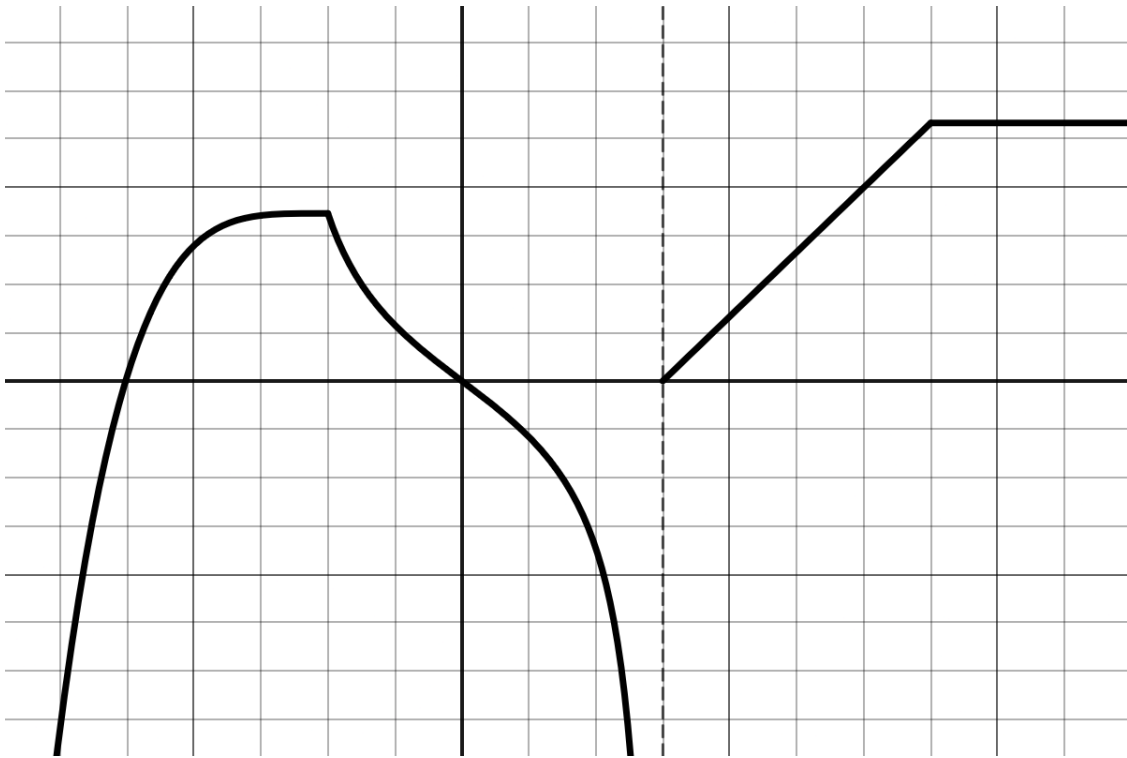
Your name: _____

## Learning target DF2, version 2

Suppose that $g(w) = 6w^3 - 2w^2 - 9w - 2$. Use the limit definition of the derivative to find $g'(w)$.

Algebra hint: $(w+h)^3 = w^3 + 3w^2h + 3wh^2 + h^3$.

**Learning target DFb, version 2**

Here is the graph of some wacky function $h(t)$:



Sketch the graph of $h'(t)$ on the blank axes below.