Math 145 - Calculus I   Name_____
The Algebra of Derivatives - Day 8

1. Suppose that $P(t)$ gives the number of fish in a lake, where t is time in weeks.

   (a) If 130 fish are born each week, what is $\dfrac{dP}{dt}$ equal to (including units)?

   (b) If state wildlife managers add 60 fish to the lake each week, what is $\dfrac{dP}{dt}$ in this case?

   (c) In reality both of those things are happening at the same time. So what is $\dfrac{dP}{dt}$ overall?

   (d) Conclusion: If $P(t) = f(t) + g(t)$, then, using $f'(t)$ and $g'(t)$,

   $$P'(t) =$$

2. Suppose that $C(x)$ is the cost to a manufacturer of producing x yoga mats.

   (a) What is the meaning of $C(50)$? What are the units of $C(50)$ and what does it mean in the context of the problem?

   (b) What is the meaning of $C'(50)$? What are the units of $C'(50)$ and what does it mean in the context of the problem?

   (c) Suppose that $C'(50) = 3.50$. If costs in the yoga mat industry suddenly double, what is the new value of $C'(50)$?

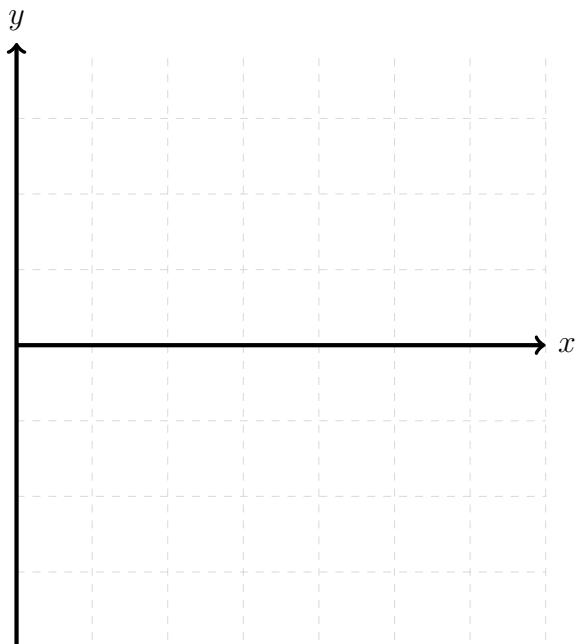   (d) What if the costs had instead tripled?

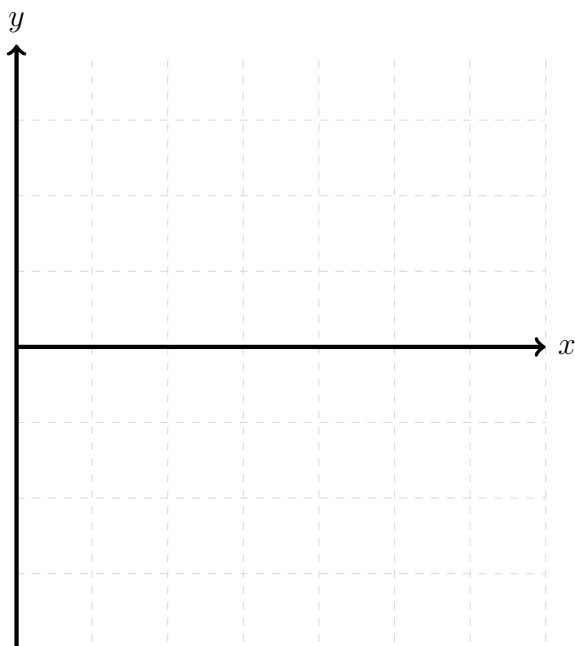   (e) Conclusion: If $C(x) = kf(x)$ for a constant k, then (use $f'(x)$ in your answer)

   $$C'(x) =$$

3. Adding a constant: $+C$:

(a) Sketch both $f(x) = \sin(2x)$ and $g(x) = \sin(2x) + 2$ for $0 \le x \le \pi$ into the axes below.

y

x

(b) Now use those graphs to sketch $f'(x)$ and $g'(x)$ into the axes below.

y

x

(c) What do you notice? Complete the sentence:

If $g(x) = f(x) + C$ for a constant C, then $g'(x) = \ldots$.