1. Given the curve $y = g(x)$,

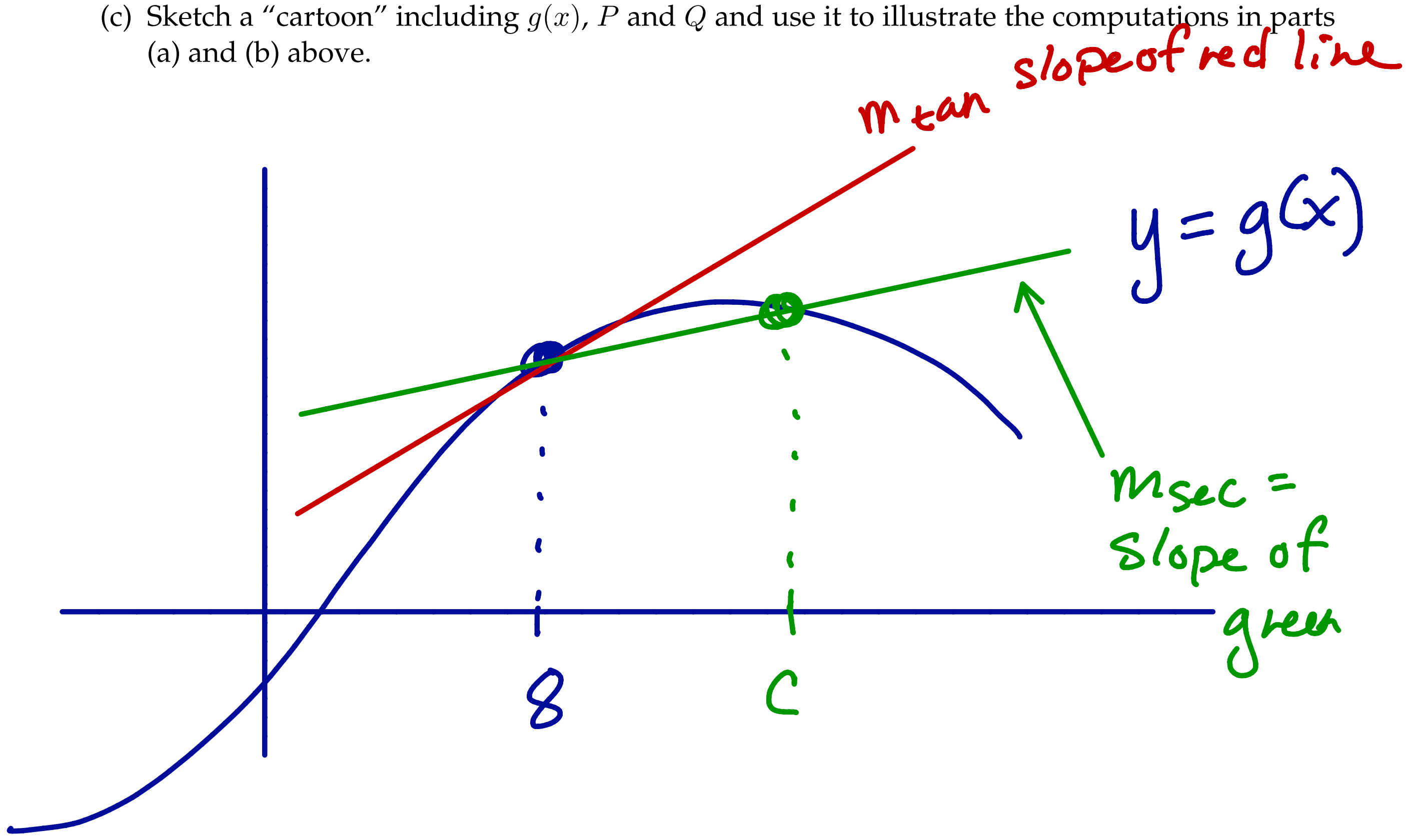
   (a) Write an expression for the slope of the secant line through the points $P(8, g(8))$ and $Q(c, g(c))$.

$$m_{sec} = \frac{g(c) - g(8)}{c - 8} = \frac{g(8) - g(c)}{8 - c}$$

   (b) Write an expression for the slope of the tangent line at $P(8, g(8))$.

$$m_{tan} = \lim_{c \to 8} \frac{g(c) - g(8)}{c - 8}$$

   (c) Sketch a "cartoon" including $g(x)$, P and Q and use it to illustrate the computations in parts (a) and (b) above.



2. (a) **Fill in the boxes** The derivative of a function f at a number a is:

$$f'(a) = \lim_{h\to 0} \boxed{\frac{f(a+h)-f(a)}{h}}$$

provided the limit exists!

(b) Use the expression above to find $f'(2)$ for $f(x) = 6x - 3x^2$.

$$f'(2) = \lim_{h\to 0} \frac{f(2+h)-f(2)}{h} = \lim_{h\to 0} \frac{6(2+h)-3(2+h)^2-[12-12]}{h}$$

$$= \lim_{h\to 0} \frac{12+6h-3(4+4h+h^2)}{h} = \lim_{h\to 0} \frac{-6h-3h^2}{h} = \lim_{h\to 0} -6-3h = -6$$

(c) Find $f(2)$. $f(2) = 6\cdot 2 - 3\cdot 2^2 = 12-12 = 0$

(d) Use the answers to parts (a) and (b) to write an equation of the line tangent to $f(x)$ when $x = 2$.

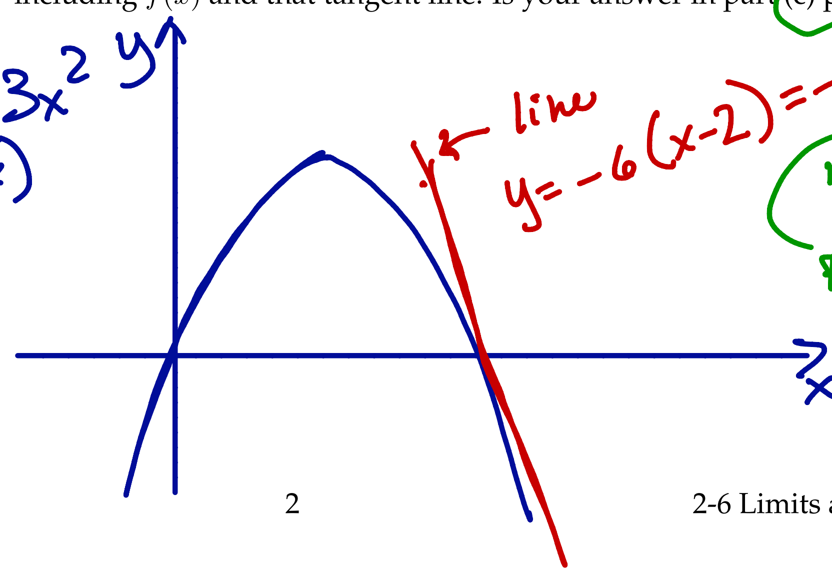
For equ. of line, I need point: $(2,0)$

slope: -6.

line: $y - 0 = -6(x-2)$ or $\boxed{y = -6(x-2)}$

(e) Sketch a "cartoon" including $f(x)$ and that tangent line. Is your answer in part (c) plausible?

$f(x) = 6x - 3x^2$
$= 3x(2-x)$



line
$y = -6(x-2) = -6x+12$

negative slope ✓

positive y-intercept