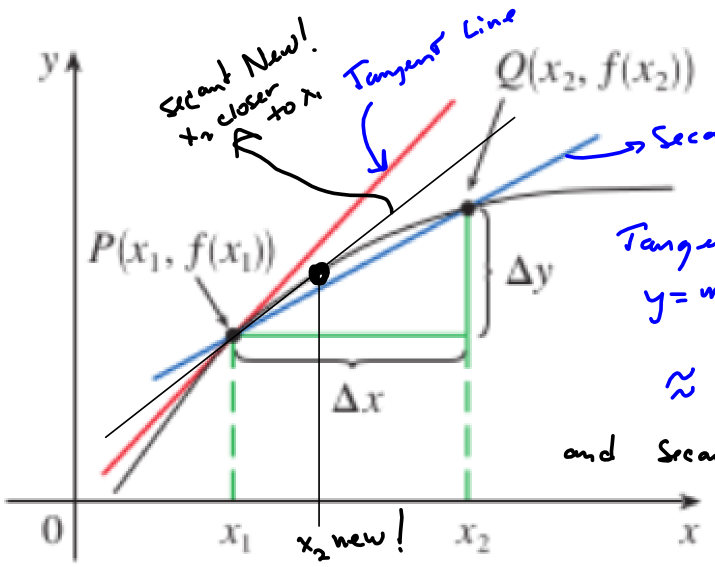


Tangent Line:

$y = m_{tan}(x - x_1) + f(x_1)$

$\approx m_{sec}(x - x_1) + f(x_1)$ = Secant Line

and Secant Line $\xrightarrow{x_2 \to x_1}$ Tangent Line.

Point-Slope: $y - y_1 = m(x - x_1)$

1. 0/2 points

A curve has equation $y = f(x)$.

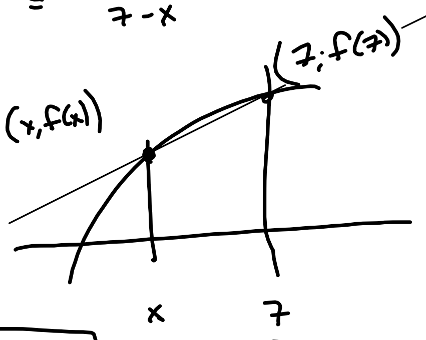
(a) Write an expression for the slope of the secant line through the points $P(7, f(7))$ and $Q(x, f(x)$

$Q(x, f(x))$

$$m_{sec} = \frac{f(x) - f(7)}{x - 7} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

$$= \frac{f(7) - f(x)}{7 - x}$$

secant Line.



#1 §2.1

(b) $\boxed{\text{tangent slope}}$ to $f(x)$ @ $x = 7$

$$\lim_{x \to 7} \frac{f(x) - f(7)}{x - 7}$$

Consider the parabola $y = 7x - x^2$.

(a) Find the slope of the tangent line to the parabola at the point (1, 6).

5 ✓

(b) Find an equation of the tangent line in part (a).

$y =$ $5x + 1$

(c) Graph the parabola and the tangent line.

$\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1} =$

$f(x) = 7x - x^2$

M1: m_{tan} @ $(1,6)$ is $\lim_{x \to 1} \frac{(7x - x^2) - (7(1) - 1^2)}{x - 1}$

$= \lim_{x \to 1} \frac{7x - x^2 - 6}{x - 1} = \lim_{x \to 1} \frac{-(x^2 - 7x + 6)}{x - 1} = \lim_{x \to 1} \frac{-(x-6)\cancel{(x-1)}}{\cancel{x-1}}$

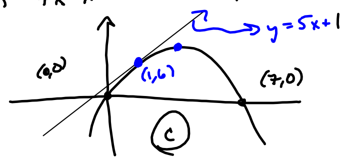
$= \lim_{x \to 1} -(x-6) = -(1-6) = -(-5) = \boxed{5 = m_{tan} \text{ (a)}}$, so

$y = m_{tan}(x - x_1) + y_1$

$= \boxed{5(x-1) + 6}$ I like!

$= 5x - 5 + 6 = 5x + 1 = y =$ WebAssign

(c) $f(x) = 7x - x^2 = x(7 - x)$



M2: $\frac{f(x) - f(1)}{x - 1} = \frac{7x - x^2 - 6}{x - 1} = \frac{-(x^2 - 7x + 6)}{x - 1} =$

$= \frac{-\cancel{(x-1)}(x-6)}{\cancel{x-1}} = -(x-6) \xrightarrow{x \to 1} -(-5) = 5 = m_{tan}$

$x \neq 1$

M3: $\frac{f(1+h) - f(1)}{h}$ yes

$= 7(1+h) - (1+h)^2 - 6 - (7(1) - 1^2 - 6)$

No. $f(x) = 7x - x^2$

$= \frac{7(1+h) - (1+h)^2 - (7(1) - 1^2)}{h}$

$= \frac{7 + 7h - (1 + 2h + h^2) - 6}{h} = \frac{7 + 7h - 1 - 2h - h^2 - 6}{h}$

$= \frac{7h - 2h - h^2}{h} = \frac{5h - h^2}{h} = \frac{h(5-h)}{h} = 5 - h \xrightarrow{h \to 0} 5 = m_{tan}$

$h \neq 0$

M4: Find m_{tan} @ any point!

$\frac{f(x+h) - f(x)}{h} = \frac{7(x+h) - (x+h)^2 - (7x - x^2)}{h}$

$= \frac{7x + 7h - (x^2 + 2xh + h^2) - 7x + x^2}{h}$

$= \frac{7x + 7h - x^2 - 2xh - h^2 - 7x + x^2}{h} = \frac{7h - 2xh - h^2}{h}$

$= \frac{\cancel{h}(7 - 2x - h)}{\cancel{h}} = 7 - 2x - h \xrightarrow{h \to 0} \boxed{7 - 2x = f'(x)}$

$h \neq 0$

Slope of the tangent @ $x = 1$ is just $f'(1) = 7 - 2(1)$

$= 5 = m_{tan}$!

$f'(x) =$ Derivative of $f(x)$.

It gives the slope of $f(x)$ by plugging in different values of x.

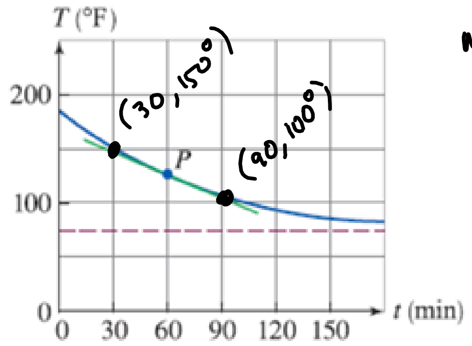
$(x_1, y_1) = (30, 150^\circ)$ S2.1 #

$(x_2, y_2) \approx (90, 100^\circ)$

x = time in minutes

y = temp in degrees Fahrenheit.

We estimate m_{tan} from those 2 points on the temp. curve for the turkey.



$$m_{tan} \approx \frac{150-100}{30-90} = \frac{50}{-60} = \left(-\frac{5}{6}\right)\frac{^\circ F}{min}$$

Change in temp. in degrees Fahrenheit per unit change in time (in minutes)

= Slope's interpretation.

Early Chapter 2: Limit Definition of the Derivative.

$$f'(x) = \lim_{c\to x} \frac{f(c)-f(x)}{c-x} = \lim_{c\to x} \frac{f(x)-f(c)}{x-c}$$

$$= \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

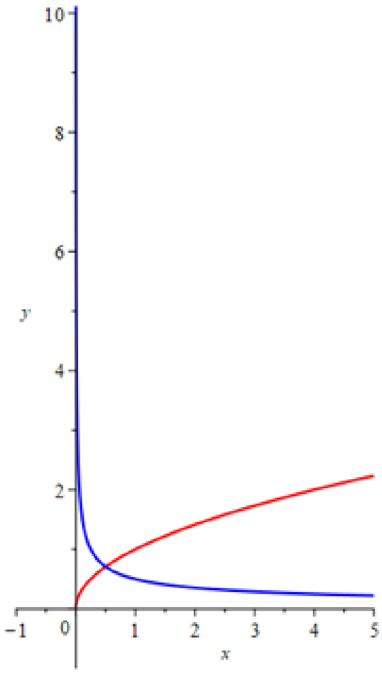
Find $f'(x)$ if $f(x) = \sqrt{x}$

$$\frac{f(x+h)-f(x)}{h} = \left(\frac{\sqrt{x+h}-\sqrt{x}}{h}\right)\left(\frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}\right)$$

Rationalize Numerator

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})} = \frac{h}{h(\sqrt{x+h}+\sqrt{x})} = \frac{1}{\sqrt{x+h}+\sqrt{x}} \xrightarrow{h\to 0} \frac{1}{\sqrt{x}+\sqrt{x}}$$

$h \neq 0$



f(x) & f'(x) on same set of axes.