Calculus AB

2-1

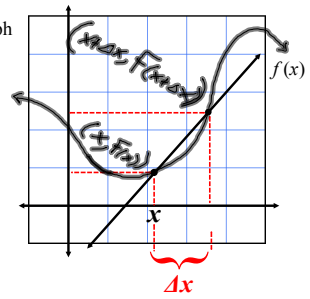
Definition of the Derivative

Show and explain how to find the slope of the secant line shown. Fill in the graph appropriately with all necessary details.

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{F(x+\Delta x) - F(x)}{x + \Delta x - x}$

$m = \frac{F(x+\Delta x) - F(x)}{\Delta x}$



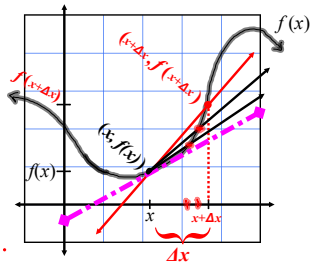
Once we have the slope of a secant line, how can we use this to find the slope of the tangent?

$m = \frac{f(x+\Delta x) - f(x)}{\Delta x}$

need to get $\Delta x = 0$, but this is undefined.

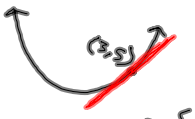
We have limits! Whew!

$\lim_{\Delta x \to 0}$



Definition of Derivative - $\lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x} = F'(x)$

What does the Derivative do? It is a function that finds the slope of a tangent line at any point of F(x).



$x = 3, F(x) = 5, F'(x) \approx 1$

Find the slope of the tangent line to the graph of the function (pg. 104) at the specified point.

old book 5) $f(x) = 3 - 2x$, (-1,5)

$\lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x} = \frac{[3 - 2(x+\Delta x)] - [3 - 2x]}{\Delta x}$

$= \frac{3 - 2x - 2\Delta x - 3 + 2x}{\Delta x} = \frac{-2\Delta x}{\Delta x} = -2$

$F'(x) = -2$

$F'(-1) = -2$

Find the derivative by the limit process.

20) $f(x) = x^3 + x^2$

$F'(x) = \lim_{\Delta x \to 0} \frac{F(x-\Delta x) - F(x)}{\Delta x} =$

$= \frac{[(x-\Delta x)^3 + (x-\Delta x)^2] - [x^3 + x^2]}{\Delta x}$

$\lim_{\Delta x \to 0} \frac{x^3 - 3x^2\Delta x + 3x\Delta x^2 - \Delta x^3 + x^2 - 2x\Delta x + \Delta x^2 - x^3 - x^2}{\Delta x}$

$\lim_{\Delta x \to 0} -3x^2 + 3x\Delta x - \Delta x^2 - 2x + \Delta x^2 = -3x^2 - 2x$

$F'(x) = -3x^2 - 2x$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

Find the derivative by the limit process.

old book 11) $f(x) = 3$

$F'(x) = \lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x} = \frac{3-3}{\Delta x} = 0$

$F'(x) = 0$

Find the derivative by the limit process.

old book 23) $f(x) = \sqrt{x+1}$

$\lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x} = \frac{\sqrt{x+\Delta x+1} - \sqrt{x+1}}{\Delta x}$

$\frac{(\sqrt{x+\Delta x+1} - \sqrt{x+1})(\sqrt{x+\Delta x+1} + \sqrt{x+1})}{\Delta x (\sqrt{x+\Delta x+1} + \sqrt{x+1})}$

$\frac{x+\Delta x+1 - (x+1)}{\Delta x(\sqrt{x+\Delta x+1} + \sqrt{x+1})} = \lim_{\Delta x \to 0} \frac{1}{\sqrt{x+\Delta x+1} + \sqrt{x+1}}$

$= \frac{1}{2\sqrt{x+1}}$

Assignment:

Pg. 104

1, 5 - 19 odd,

22, 24