Calculus AB

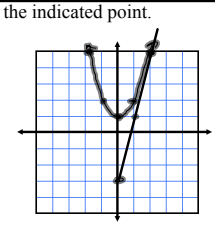
2-1

(Day 3)

Definition of the Derivative

Find an equation of the tangent line to the graph of f at the indicated point.
(pg 104)

25) $f(x) = x^2 + 1, \quad (2,5)$



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

$\lim_{\Delta x \to 0} \frac{[(x+\Delta x)^2 + 1] - [x^2+1]}{\Delta x}$

$= \frac{x^2+2x\Delta x+\Delta x^2+1-x^2-1}{\Delta x} = \frac{2x\Delta x+\Delta x^2}{\Delta x} = 2x+\Delta x = 2x$

$F'(x) = 2x$

$F'(2) = 2(2) = 4 \quad m = 4$

$y = mx+b$

$y = 4x+b$

$5 = 4(2)+b$

$-3 = b$

$y = 4x-3$

$m = \frac{\Delta y}{\Delta x} \qquad \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \frac{dy}{dx} = f'(x)$

Find an equation of the line that is tangent to the graph of f and parallel to the given line.

same slope

Function: 33) $f(x) = x^3$

Line: $3x - y + 1 = 0$

$3x+1 = y \quad m = 3$

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

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

$f'(x) = 3x^2$

$3 = 3x^2$

$\pm 1 = x$

x, y

$(1,1) \quad y = 3x-2$

$(-1,-1) \quad y = 3x+2$

$y = 3x+b$

$1 = 3(1)+b$

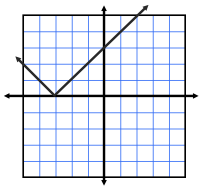
$-2 = b$

$-1 = 3(-1)+b$

$2 = b$

Describe the x-values at which f is differentiable.

71) $f(x) = |x+3|$



$\mathbb{R}$ except $\{-3\}$

There is no derivative at -3 because there is a sharp point on the graph. There could be an infinite number of tangent lines drawn at this point.

Assignment:

Pg. 104

25 - 37 odd,

39 - 42 all,

83 - 92 all