3.1/3.2

Thursday, August 29, 2019 8:19 AM

Differentiability

A function is differentiable at a point $x = a$ if the function is locally linear.

$$y = x^2 \qquad x = 2$$

When will the derivative not exist??

$y = |x|$ @ $x = 0$ — not diff @ $x = 0$

Corner

left & right derivatives do not equal

$y = x^{2/3}$ @ $x = 0$ — not diff @ $x = 0$

CUSP

Derivatives are approaching ∞ and $-\infty$ on either side.

$y = \sqrt[3]{x}$ @ $x = 0$ — not diff @ $x = 0$

Vertical tangent

$y = \frac{|x|}{x}$ @ $x = 0$ — Discontinuous @ $x = 0$

$\therefore$ not diff

Theorem If f is differentiable at all x-values then f must be continuous at all x-values.

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ex: $f(x) = |x-3| + 5$ not diff @ $x=3$ corner

Ex: $f'(3)$ if $f(x) = e^{4x}$ (on calculator)

$$= \frac{d}{dx} e^{4x} \Big|_{x=3}$$

Use calc. and write the equation of the tangent line to $g(x) = \frac{2x}{1-x^2}$ @ $x=2$

$m = 1$ $(2, -4/3)$ p.o.t

$$y + 4/3 = 1.111(x-2)$$