Bell Work

Evaluate the following limit.

$$\lim_{x \to 4} \frac{x^2 - x - 12}{x - 4}$$

From Last Time…

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PRE-CALC TRIG

Day 19

12.2 Techniques for Evaluating Limits

Objective: Evaluate one-sided limits

12.3 The Tangent Line Problem

Objective: Find Derivatives of functions and find slopes of graphs.

Remember… Definition of Limit

If $f(x)$ becomes arbitrarily close to a unique number L as x $approaches\ c\ from\ either\ side,$ $the\ limit\ of\ \ f(x)$ as x approaches c is L.

$$\lim_{x \to c} f(x) = L$$

12.2 Techniques for Evaluating Limits

$$\lim_{x \to c^-} f(x) = L_1$$

$$\lim_{x \to c^+} f(x) = L_2$$

Example 1:

$$\lim_{x \to 0^+} \frac{|5x|}{x}$$

$$\lim_{x \to 0^-} \frac{|5x|}{x}$$

x	3	2	1	0.5	0.25
f(x)					

x	-3	-2	-1	-0.5	-0.25
f(x)					

Example 1:

$$\lim_{x \to 0^+} \frac{|5x|}{x}$$

x	3	2	1	0.5	0.25
f(x)	5	5	5	5	5

$$\lim_{x \to 0^-} \frac{|5x|}{x}$$

x	-3	-2	-1	-0.5	-0.25
f(x)	-5	-5	-5	-5	-5

$$\lim_{x \to 0^+} \frac{|5x|}{x} = 5$$

$$\lim_{x \to 0^+} \frac{|5x|}{x} = -5$$

12.3 The Tangent Line Problem

Definition of Derivative

The derivative of f at x is given by

$$\boldsymbol{f'(\mathbf{x}) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}}$$ provided this limit exists.

Example:

Find the derivative and use it to identify the slope of the tangent through the given point.

$f(x) = 3x^2 - 6x \quad (2, 0)$

$$\underline{f(x) = 3x^2 - 6x \qquad (2,0)}$$

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

$$f'(\mathrm{x}) = \lim_{h \to 0} = \frac{3x^2 + 6xh + 3h^2 - 6x - 6h - 3x^2 + 6x}{h}$$

$$f'(\mathrm{x}) = \lim_{h \to 0} = \frac{6xh + 3h^2 - 6h}{h} = \frac{h(6x + 3h - 6)}{h}$$

$$f'(\mathrm{x}) = \lim_{h \to 0} 6x + 3h - 6 \quad = \quad \boldsymbol{6x - 6}$$

Solution

Since the derivative is 6x-6…

Therefore the slope of the tangent through (2,0) is at f'(2)=6(2) – 6 …

f'(2) = 6

Graph to see.

For next time…

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