

Watch. Practice. Understand. | Lesson 263

Calculus 2 7 Derivative with Limit Definition and Rate of Change

Watch the matching video: <https://www.youtube.com/watch?v=1A8vGVcW5M4>

Practice focus: Derivative definition and basic rules

Original extra practice matched to the listed lesson topic.

Name: _____ Date: _____ Show your reasoning and check units.

01 Use the limit definition to differentiate $f(x)=x^2+3x$.

02 Differentiate $f(x)=4x^5 - 3x^2 + 7$.

03 Find the tangent line to $y=x^2$ at $x=2$.

04 Where is $f(x)=|x|$ not differentiable, and why?

Worked answers | Lesson 263

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01 Use the limit definition to differentiate $f(x)=x^2+3x$.

$$[f(x+h)-f(x)]/h = 2x+h+3. \text{ Let } h \rightarrow 0: f'(x)=2x+3.$$

02 Differentiate $f(x)=4x^5 - 3x^2 + 7$.

$$\text{Power rule term by term: } f'(x)=20x^4 - 6x.$$

03 Find the tangent line to $y=x^2$ at $x=2$.

$$\text{Point } (2,4), \text{ slope } 2x=4. \text{ Tangent: } y-4=4(x-2), \text{ or } y=4x-4.$$

04 Where is $f(x)=|x|$ not differentiable, and why?

At $x=0$; the left slope is -1 and the right slope is 1, so the derivative limit fails.