

Watch. Practice. Understand. | Lesson 305

The Secret of Calculus 4 5 Graphing Functions Without Using Any Calculator

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

Practice focus: Extrema and derivative tests

Original extra practice matched to the listed lesson topic.

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

01 Find critical numbers of $f(x)=x^3-3x$.

02 Classify those critical numbers using the second derivative.

03 Find the absolute extrema of $f(x)=x^2-4x$ on $[0,5]$.

04 Find increasing intervals and concavity of $f(x)=x^3$.

Worked answers | Lesson 305

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Practice focus: Extrema and derivative tests

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01 Find critical numbers of $f(x)=x^3-3x$.

$$f'(x)=3x^2-3=0 \text{ gives } x=\pm 1.$$

02 Classify those critical numbers using the second derivative.

$$f''(x)=6x. \text{ At } -1, f''<0: \text{ local maximum } f(-1)=2. \text{ At } 1, f''>0: \text{ local minimum } f(1)=-2.$$

03 Find the absolute extrema of $f(x)=x^2-4x$ on $[0,5]$.

Critical $x=2$ gives -4 ; endpoints give 0 and 5 . Absolute minimum -4 at 2 ; maximum 5 at 5 .

04 Find increasing intervals and concavity of $f(x)=x^3$.

$f'=3x^2 \geq 0$ gives increasing on all real numbers. $f''=6x$: concave down on $x<0$, up on $x>0$; inflection at $(0,0)$.