

Watch. Practice. Understand. | Lesson 315

The Secret Strategies Revealed For Studying The Upcoming Calculus Final

Watch the matching video: <https://www.youtube.com/watch?v=BxyRji556Ec>

Practice focus: Derivative definition and basic rules

Related course review; confirm topics with your teacher.

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?

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Watch the matching video: <https://www.youtube.com/watch?v=BxyRji556Ec>

Practice focus: Basic integration and net change

Related course review; confirm topics with your teacher.

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

05 Find an antiderivative of $6x^2 - 4x + 3$.

06 Evaluate the integral of $2x$ from 0 to 3.

07 Find the indefinite integral of $1/x$ for $x \neq 0$.

08 A quantity starts at 10 and changes at rate $r(t) = 2t$ for $0 \leq t \leq 3$. Find its final value.

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The Secret Strategies Revealed For Studying The Upcoming Calculus Final

Watch the matching video: <https://www.youtube.com/watch?v=BxyRji556Ec>

Practice focus: Area between curves

Related course review; confirm topics with your teacher.

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

09 Find area between $y=x$ and $y=x^2$ on $[0,1]$.

10 Find area enclosed by $y=4-x^2$ and $y=0$.

11 Find area between $y=x$ and $y=-x$ on $[-1,1]$.

12 Find intersections and enclosed area of $y=x^2$ and $y=2x+3$.

Worked answers | Lesson 315

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Practice focus: Derivative definition and basic rules

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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.

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05 Find an antiderivative of $6x^2-4x+3$.

Integrate termwise: $2x^3-2x^2+3x+C$. Differentiating recovers the integrand.

06 Evaluate the integral of $2x$ from 0 to 3.

Antiderivative x^2 ; endpoint difference $9-0=9$.

07 Find the indefinite integral of $1/x$ for $x \neq 0$.

$\ln|x|+C$ on an interval not crossing 0.

08 A quantity starts at 10 and changes at rate $r(t)=2t$ for $0 \leq t \leq 3$. Find its final value.

$10 + \text{integral from 0 to 3 of } 2t \, dt = 10+9=19$.

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Practice focus: Area between curves

Related course review; confirm topics with your teacher.

09 Find area between $y=x$ and $y=x^2$ on $[0,1]$.

Upper minus lower: $\int_0^1 (x-x^2) dx = 1/2 - 1/3 = 1/6$.

10 Find area enclosed by $y=4-x^2$ and $y=0$.

Intersections $x=\pm 2$. $\int_{-2}^2 (4-x^2) dx = 32/3$.

11 Find area between $y=x$ and $y=-x$ on $[-1,1]$.

Upper curve switches at 0. $\int_{-1}^1 2|x| dx = 2$.

12 Find intersections and enclosed area of $y=x^2$ and $y=2x+3$.

Intersections $x=-1, 3$. $\int_{-1}^3 (2x+3-x^2) dx = 32/3$.