

Watch. Practice. Understand. | Lesson 348

Calculus BC 2019 Free Respond Questions in Depth Analysis

Watch the matching video: <https://www.youtube.com/watch?v=7L8TmAOFPP4>

Practice focus: Displacement and distance

Related course review; confirm topics with your teacher.

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

01 A particle has velocity $v(t)=2t-4$ on $[0,4]$. Find displacement.

02 For the same particle, find total distance traveled.

03 If $s(0)=3$ for that particle, find $s(t)$.

04 When is that particle moving in the negative direction, and when does it reverse?

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Practice focus: Separable differential equations and slope fields

Related course review; confirm topics with your teacher.

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

05 Solve $y' = 2xy$ with $y(0) = 3$.

06 For $y' = x - y$, find slopes at $(0,1)$, $(1,1)$, and $(2,1)$.

07 Solve $y' = 3y$ with $y(0) = 2$.

08 Find equilibrium solutions of $y' = y(4 - y)$.

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Practice focus: Power series and intervals of convergence

Related course review; confirm topics with your teacher.

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

09 Find radius and interval of convergence of $\sum x^n, n \geq 0$.

10 Find radius and interval for $\sum (x-2)^n/(n3^n), n \geq 1$.

11 Write a power series for $1/(1-x)^2$ valid for $|x| < 1$.

12 Integrate the geometric series from 0 to x to obtain a series for $-\ln(1-x)$.

Worked answers | Lesson 348

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01 A particle has velocity $v(t)=2t-4$ on $[0,4]$. Find displacement.

Integral of v is $[t^2-4t]_0^4=0$.

02 For the same particle, find total distance traveled.

Velocity changes sign at $t=2$. Integrate $|v|$: 4 units on $[0,2]$ and 4 on $[2,4]$, total 8.

03 If $s(0)=3$ for that particle, find $s(t)$.

Integrating v gives $s=t^2-4t+C$; $C=3$, so $s(t)=t^2-4t+3$.

04 When is that particle moving in the negative direction, and when does it reverse?

$v<0$ on $0\leq t<2$; $v>0$ on $2<t\leq 4$. It reverses direction at $t=2$.

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05 Solve $y' = 2xy$ with $y(0) = 3$.

Separate $dy/y = 2x \, dx$. $\ln|y| = x^2 + C$, so $y = 3e^{x^2}$.

06 For $y' = x - y$, find slopes at $(0,1)$, $(1,1)$, and $(2,1)$.

Substitute coordinates: -1, 0, and 1 respectively.

07 Solve $y' = 3y$ with $y(0) = 2$.

Separate or recognize exponential growth: $y = 2e^{(3t)}$ if independent variable is t ; using x , $y = 2e^{(3x)}$.

08 Find equilibrium solutions of $y' = y(4 - y)$.

Set the derivative to zero: $y = 0$ and $y = 4$ are constant solutions.

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09 Find radius and interval of convergence of $\sum x^n, n \geq 0$.

Geometric series converges for $|x| < 1$; at ± 1 terms fail to approach 0. Radius 1, interval $(-1, 1)$.

10 Find radius and interval for $\sum (x-2)^n / (n3^n), n \geq 1$.

Ratio gives $|x-2| < 3$. At $x=-1$: alternating harmonic converges; at $x=5$: harmonic diverges. Radius 3; interval $[-1, 5)$.

11 Write a power series for $1/(1-x)^2$ valid for $|x| < 1$.

Differentiate geometric series: $\sum_{n=1}^{\infty} n x^{(n-1)}$.

12 Integrate the geometric series from 0 to x to obtain a series for $-\ln(1-x)$.

Termwise integration gives $\sum x^{(n+1)} / (n+1), n \geq 0$, for $|x| < 1$. This is $-\ln(1-x)$.