

AP Calculus AB - Linearization and L'Hopital's Rule - Test

Common Core AP CALC AB 4.5, AP CALC AB 4.6, AP CALC AB 4.7 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

This test checks local linear approximation, over- and underestimates from concavity, and L'Hopital's Rule for indeterminate limits (AP Calculus AB, 4.5, 4.6, 4.7). It has 8 questions worth 20 points in total. Allow 45 minutes, work without notes, and show all work, since justification earns points on the AP exam.

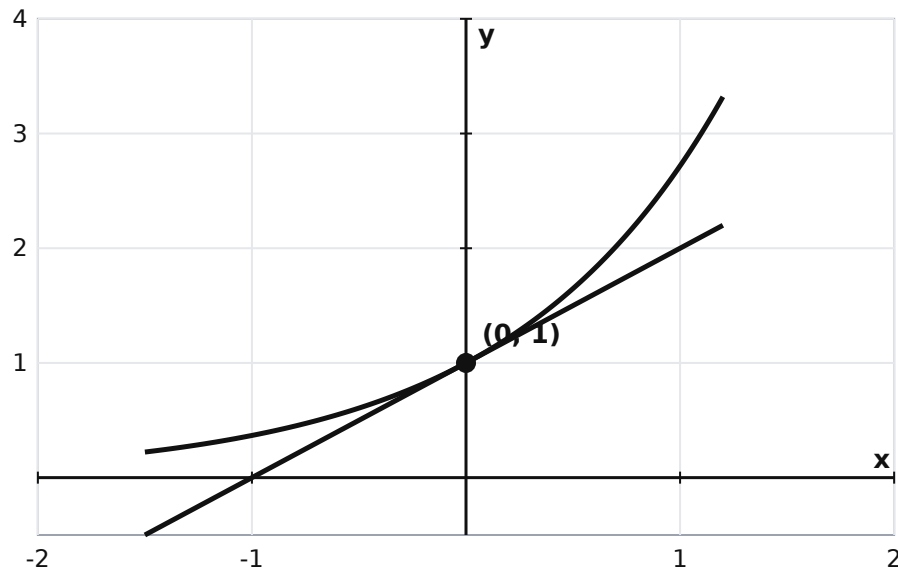
About this test

- Grade: AP Calculus AB
- Chapter: Linearization and L'Hopital's Rule
- Standards: AP CALC AB 4.5, AP CALC AB 4.6, AP CALC AB 4.7
- Time: 45 minutes
- Total: 20 points

Question 1 - Linearization [2 pts]

Find the linearization of $f(x) = \sqrt{x}$ at $a = 16$ and use it to estimate $\sqrt{17}$.

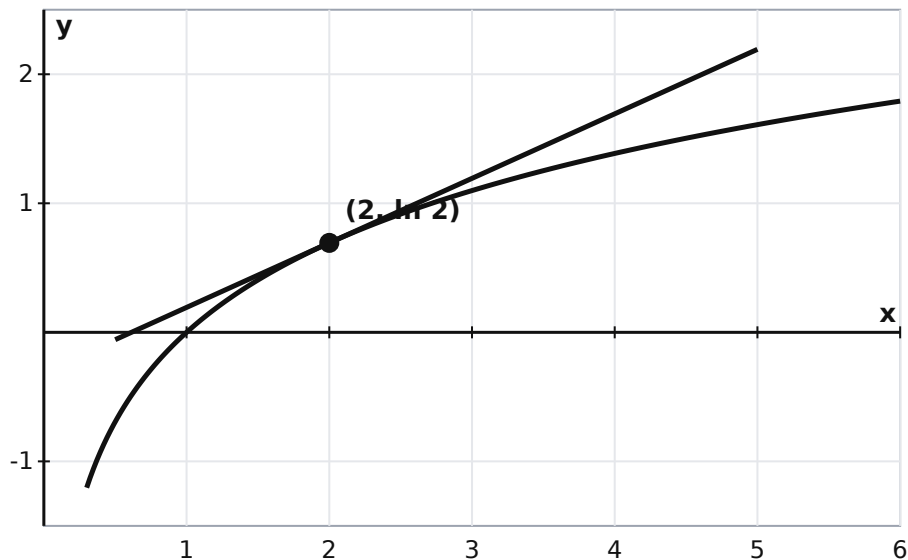
Question 2 - Tangent line estimate [3 pts]



The graph of e^x and its tangent line at $x = 0$.

Let $f(x) = e^x$. (a) Write the linearization at $a = 0$. (1 point) (b) Estimate $e^{0.2}$. (1 point) (c) Is your estimate an over- or underestimate? Justify with f'' . (1 point)

Question 3 - Over or under [2 pts]



The graph of $\ln x$ and its tangent at $x = 2$.

The tangent line to $f(x) = \ln x$ at $x = 2$ is used to estimate $\ln 2.1$. Is the estimate too high or too low? Justify.

Question 4 - Using a table [3 pts]

x	3.5	4	4.5
f(x)	11.7	10	8.6

Values of f.

A function has $f(4)=10$ and $f'(4)=-3$; the table gives other values. (a) Use a linear approximation to estimate $f(4.5)$. (1 point) (b) Compare with the table value. (1 point) (c) Based on the comparison, is f concave up or concave down near $x=4$? (1 point)

Question 5 - Hopital 0 over 0, second form [2 pts]

Evaluate $\lim_{x \rightarrow 3} \frac{x^3-27}{x^2-9}$ using L'Hôpital's Rule.

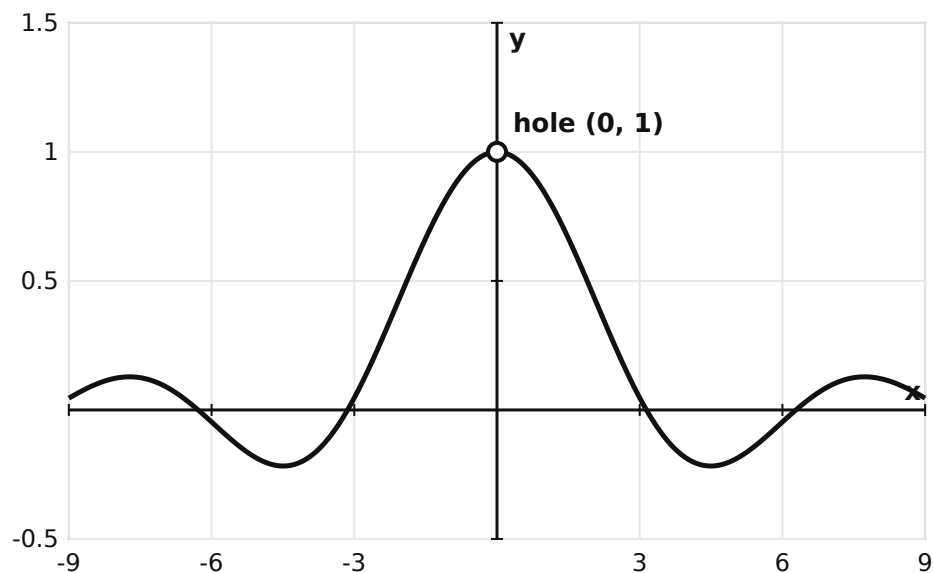
Question 6 - Hopital infinity form [3 pts]

Evaluate $\lim_{x \rightarrow \infty} \frac{(\ln x)^2}{x}$ using L'Hôpital's Rule. Show each application.

Question 7 - Error estimation [2 pts]

The side of a square window is measured as 24 inches, with a possible error of 0.25 inch. Use a linear approximation to estimate the possible error in its area.

Question 8 - Limit by two methods [3 pts]



The graph of $\sin x / x$.

- (a) Use L'Hôpital's Rule to evaluate $\lim_{x \rightarrow 0} \frac{\sin x}{x}$. (1 point) (b) Evaluate $\lim_{x \rightarrow 0} \frac{\tan x}{x}$. (1 point) (c) Explain why L'Hôpital's Rule cannot be used on $\lim_{x \rightarrow 0} \frac{\cos x}{x+1}$. (1 point)