

AP Calculus AB - Power, Sum and Basic Function Derivative Rules - Test Answer Key

Common Core AP CALC AB 2.5, AP CALC AB 2.6, AP CALC AB 2.7 · maths-pdf.fr/en/

Use this answer key to score the derivative rules test out of 20 points. Each solution shows the work and a scoring guide that says how the points are awarded. Give partial credit for a correct setup, a correct derivative or integral, and a correct final statement with units where they apply.

AP Calculus AB · Common Core State Standards: **AP CALC AB 2.5, AP CALC AB 2.6, AP CALC AB 2.7**

Question 1 - Polynomial derivative [2 pts]

$f'(x) = 20x^3 - 9x^2 + 2$. Final answer: $20x^3 - 9x^2 + 2$.

Scoring: 1 point for the first two terms; 1 point for the last two terms.

Question 2 - Roots and reciprocals [2 pts]

Rewrite: $4x^{1/2} - 3x^{-1} + x^{5/2}$. Then $f'(x) = 2x^{-1/2} + 3x^{-2} + \frac{5}{2}x^{3/2}$.

Final answer: $\frac{2}{\sqrt{x}} + \frac{3}{x^2} + \frac{5}{2}x^{3/2}$.

Scoring: 1 point for rewriting with powers; 1 point for the derivative.

Question 3 - Trig, exponential and log [2 pts]

$-2\sin x + 3e^x - \frac{1}{x}$.

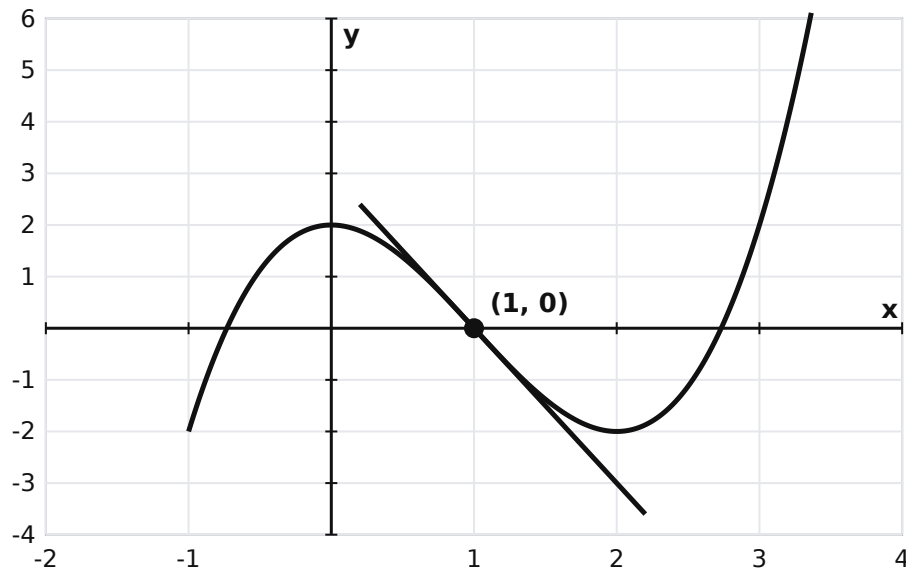
Final answer: $-2\sin x + 3e^x - \frac{1}{x}$.

Scoring: 1 point for the cosine and exponential terms; 1 point for the logarithm term and signs.

Question 4 - Tangent line [3 pts]

$$f(1) = 1 - 3 + 2 = 0 \text{ and } f'(x) = 3x^2 - 6x, \text{ so } f'(1) = -3.$$

$$\text{Tangent: } y - 0 = -3(x - 1), \text{ so } y = -3x + 3.$$



Graph of $f(x) = x^3 - 3x^2 + 2$.

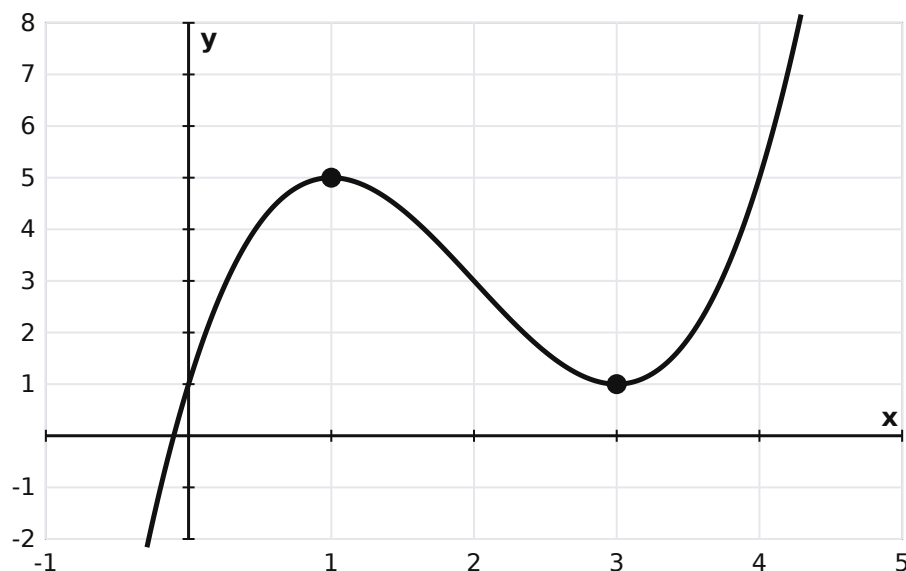
Scoring: 1 point for $f(1)$; 1 point for $f'(1)$; 1 point for the equation.

Question 5 - Horizontal tangents [3 pts]

$$g'(x) = 3x^2 - 12x + 9 = 3(x-1)(x-3). \text{ Zero at } x=1 \text{ and } x=3.$$

$$g(1) = 5 \text{ and } g(3) = 1.$$

Final answer: (1,5) **and** (3,1).



Graph of $g(x) = x^3 - 6x^2 + 9x + 1$.

Scoring: 1 point for g' ; 1 point for the x -values; 1 point for the y -values.

Question 6 - Normal line [2 pts]

$f(2)=5$ and $f'(2)=4$. The normal slope is $-\frac{1}{4}$.

$y-5=-\frac{1}{4}(x-2)$. Final answer: $y=-\frac{1}{4}x+\frac{11}{2}$.

Scoring: 1 point for the normal slope; 1 point for the equation.

Question 7 - Velocity in context [3 pts]

- $v(t)=3t^2-18t+15$.
- $v(2)=12-36+15=-9$ ft/s.
- $3(t-1)(t-5)=0$, so at $t=1$ **and** $t=5$ **seconds**.

Scoring: 1 point per part.

Question 8 - Unknown constants [3 pts]

Slope: $f'(1)=2+b=3$, so $b=1$. Point: the tangent line at $x=1$ gives $f(1)=3(1)+1=4$.

$f(1)=1+1+c=4$, so $c=2$.

Final answer: $b=1$, $c=2$.

Scoring: 1 point for b ; 1 point for the value $f(1)$; 1 point for c .

Total
20 points