

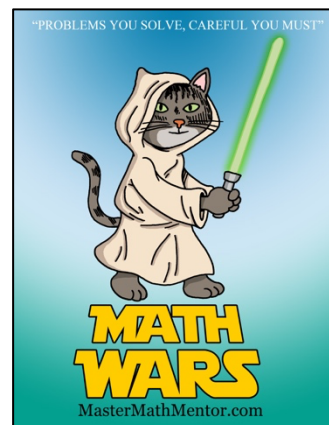
Math Wars – AB Calculus

Scrambled 169 – Limits & Derivatives



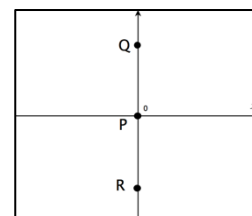
Maximum Time: 8.25 Minutes

Directions: To start, you need to download the Math Wars application on your cell phone: Use the QR code or the url: <https://mastermathmentor.com/mmm/mathwars.ashx?key=169>



When ready, start the timer and then solve the problems below, entering your choice, A, B, C, D and pressing **Submit** for each problem when you are sure of your answer. When complete, stop the timer. You will see problems you got correct in green and incorrect in red. You will receive a score based on how many problems you got right and your time. A perfect score is all problems correct using half the maximum time or less. You can text or email your friends with your results.

1. (1 pt) The graph of differentiable function $f(x)$ has a relative minimum at $x = 0$. The graph to the right shows three points, P, Q and R. $f(0)$, $f'(0)$ and $f''(0)$ are located at these points. Which of the following must be true?



- | | | | |
|----------------|----------------|----------------|----------------|
| $f(0) = R$ | $f(0)$ unknown | $f(0) = R$ | $f(0)$ unknown |
| A. $f'(0) = P$ | B. $f'(0) = P$ | C. $f'(0) = Q$ | D. $f'(0) = Q$ |
| $f''(0) = Q$ | $f''(0) = Q$ | $f''(0) = P$ | $f''(0) = P$ |

2. (3 pts) Which of the following is a formula for the derivative of $f(x)$ at $x = a$ for all functions f ?

I. $\lim_{\Delta x \rightarrow 0} \frac{f(a + \Delta x) - f(a)}{\Delta x}$ II. $\lim_{\Delta x \rightarrow 0} \frac{f(a + \Delta x) - f(a - \Delta x)}{\Delta x}$ III. $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$

- A. I and II only B. II and III only C. I and III only D. I, II and III

3. (5 pts) Sand falls from an overhead bin, creating a conical pile whose diameter is always 4 times its height. If the sand falls at a rate of $72 \text{ ft}^3/\text{min}$, how fast is the height of the pile increasing when the pile is 3 feet high?

- A. $\frac{1}{\pi}$ ft/sec B. $\frac{1}{2\pi}$ ft/sec C. $\frac{2}{\pi}$ ft/sec D. 2π ft/sec

4. (7 pts) Use the linear approximation for $f(x) = \frac{1}{\sqrt{x}}$ to best approximate $\frac{1}{\sqrt{4.5}}$.

- A. $\frac{3}{8}$ B. $\frac{5}{8}$ C. $\frac{15}{32}$ D. $\frac{17}{32}$

5. (9 pts) If $x^2 + 2y^2 = 24$, find $\frac{d^2y}{dx^2}$ at $(-4, -2)$

A. -1

B. $-\frac{1}{4}$

C. $\frac{3}{4}$

D. $\frac{1}{2}$