

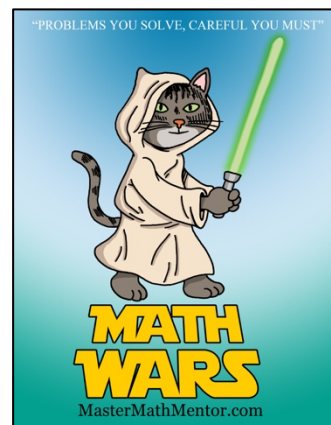
Math Wars – AB Calculus

Scrambled 154 – 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=154>



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) If $f(x) = 4\cos 4x$, $f'\left(\frac{\pi}{16}\right) =$

A. $\frac{\sqrt{2}}{32}$

B. 16

C. $-8\sqrt{2}$

D. 0

2. (3 pts) Suppose that the cost of manufacturing specialized canoes is $C(x) = 4x^3 - 300x + 8000$ where x is the number of canoes constructed. What is the number of canoes that the company should construct that will minimize their average cost?

A. 5

B. 10

C. 15

D. 18

3. (5 pts) Find $\lim_{x \rightarrow \infty} \left(\frac{\sqrt{3x^2 + 9}}{3 - 2x} \right) - \lim_{x \rightarrow -\infty} \left(\frac{\sqrt{3x^2 + 9}}{3 - 2x} \right)$

A. 0

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{3}$

D. $-\sqrt{3}$

4. (7 pts) Which of the following describes the function? $f(x) = \begin{cases} \cos 2x - 2\cos x + \sin 2x - 2\sin x, & x \geq 0 \\ -x - e^{-x}, & x < 0 \end{cases}$

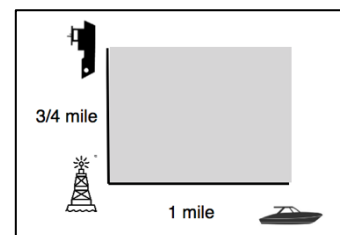
A. Neither continuous nor differentiable

B. Continuous but not differentiable

C. Differentiable but not continuous

D. Both continuous and differentiable

5. (9 pts) A coast guard cutter is monitoring traffic as shown in the figure to the right. A speedboat passes a buoy going 10 mph. Using binoculars, the coast guard checks the boat's registration and realizes it was stolen. The coastguard follows the speedboat at 20 mph but cannot go into the area shown in grey because the water is too shallow. How fast is the distance between the coastguard and speedboat changing when the coastguard is $\frac{3}{4}$ mile from the buoy and the speedboat is 1 mile from the buoy?



A. decreasing at 4 mph

B. decreasing at 10 mph

C. decreasing at 10 mph

D. not changing