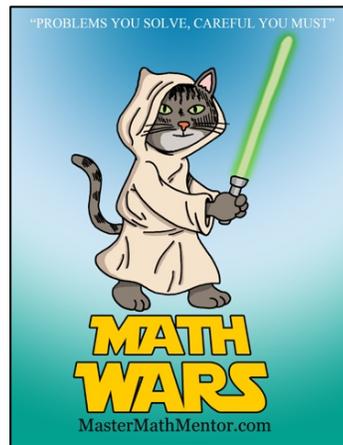# Math Wars – AB Calculus
Scrambled 178 – Integrals and Applications

Maximum Time: 7.75 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=178

When ready, start the timer and then solve the problems below, entering your choice, A, B, C, D and pressing $\boxed{\text{Submit}}$ 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 $f(x) = \tan^{-1}(6x)$, order the following from highest to lowest.

$\quad$ I. $f'(0)$ $\qquad\qquad$ II. $f'(1)$ $\qquad\qquad$ III. $f'(-1/2)$

$\quad$ A. I, II, III $\qquad$ B. I, III, II $\qquad$ C. II, III, I $\qquad$ D. III, II, I

2. (3 pts) The average value of the function $f(x) = x^3 - x - 1$ on the interval $[-2, 4]$ is

$\quad$ A. 0 $\qquad\qquad$ B. 8 $\qquad\qquad$ C. $\dfrac{28}{3}$ $\qquad\qquad$ D. 24

3. (5 pts) In Spring, $g(t)$ is the rate of growth of leaves on a tree while $w(t)$ is the rate that wind blows leaves off the tree, both measured in leaves/day. Let $L(t) = \int_0^t [g(x) - w(x)]\,dx$ and $L'(7) = 500$. Which of the following is the correct interpretation?

$\quad$ A. After a week, there are 500 more leaves on the tree than before.
$\quad$ B. After a week, the tree is gaining 500 leaves per day.
$\quad$ C. After a week, the tree's change in growth is 500 leaves per day per day.
$\quad$ D. None of these

4. (7 pts) If F is a continuous function and $F'(x) = f(x)$ for all real numbers x, then $\displaystyle\int_0^{\pi/2} f(1 + 2\sin x)\cos x \, dx$ is equivalent to:

$\quad$ A. 2 $\qquad$ B. 4 $\qquad$ C. $2[F(3) - F(1)]$ $\qquad$ D. $\dfrac{1}{2}[F(3) - F(1)]$

5. (9 pts) If $f(x) = \int_{-2}^{x} f'(t)\,dt$ where $f'(x)$ is shown in the figure to the right, find the equation of the tangent line to f at $x = 3$.

A. $y = 3 - x$

B. $2x + 2y = 11$

C. $2x + 2y = 9$

D. tangent line has undefined slope