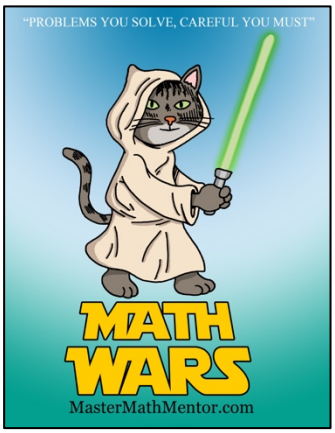
Math Wars – BC Calculus
Topic 208 – Parametric Equations



Maximum Time: 8.5 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=208

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) Point $P(x,y)$ moves in the xy-plane in such a way that $x = e^{2t}$ and $y = \ln t$ for $t > 0$. Find the instantaneous rate of change of y with respect to x when $t = 1/2$.

A. e B $2e$ C. $\frac{1}{e}$ D. $\frac{1}{4e}$

2. (3 pts) Find the behavior of the curve at $t = 2$ of the parametric equations $x = 10 - t - t^2$ and $y = 4t - 1$.

A. increasing, concave up
B. increasing, concave down
C. decreasing, concave up
D. decreasing, concave down

3. (5 pts) Find $\frac{d^2y}{dx^2}$ for the parametric equations $x = 3\sin\theta$ and $y = \tan\theta$.

A. $\frac{3\sin\theta}{\cos^5\theta}$ B. $\frac{\sin\theta}{3\cos^5\theta}$ C. $\frac{1}{3\cos^5\theta}$ D. $\frac{3}{\cos^5\theta}$

4. (7 pts) Find the values of t for which the graph of the parametric equations $x = 3t^4 - 4t^3 - 12t^2 + 1$ and $y = 2t^3 - 9t^2 + 12t - 2$ has a vertical tangent.

I. $t = -1$ II. $t = 0$ III. $t = 1$ IV. $t = 2$

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

5. (9 pts) A relation is defined parametrically. Its position in the plane is $(x(t), y(t))$ with $\frac{dx}{dt} = \cos t$ and $\frac{dy}{dt} = \sin t \cos t$. If the particle is at the point $(-3,2)$ at $t = 0$, find the position of the particle at $t = \pi/6$.

A. $\left(\frac{-5}{2}, \frac{17}{8}\right)$ B. $\left(\frac{-5}{2}, \frac{9}{4}\right)$ C. $\left(\frac{1}{2}, \frac{1}{4}\right)$ D. $\left(\frac{1}{2}, \frac{1}{8}\right)$