DATE: _____

Arc Length (Parametric & Vectors)

1. The length of the path described by the parametric equations $x = \cos^3 t$ and $y = \sin^3 t$, for $0 \leq t \leq \frac{\pi}{2}$, is given by

   (A) $\int_0^{\pi/2} \sqrt{3\cos^2 t + 3\sin^2 t}\, dt$

   (B) $\int_0^{\pi/2} \sqrt{-3\cos^2 t \sin t + 3\sin^2 t \cos t}\, dt$

   (C) $\int_0^{\pi/2} \sqrt{9\cos^4 t + 3\sin^4 t}\, dt$

   (D) $\int_0^{\pi/2} \sqrt{9\cos^4 t \sin^2 t + 9\sin^4 t \cos^2 t}\, dt$

   (E) $\int_0^{\pi/2} \sqrt{\cos^6 t + \sin^6 t}\, dt$

2. A particle move in the *xy*-plane so that its position at any time t is given by $x(t) = t^2$ and $y(t) = \sin(4t)$. What is the speed of the particle when $t = 3$?

   (A) 2.909

   (B) 3.062

   (C) 6.884

   (D) 9.016

   (E) 47.393

3. For $t \geq 0$, a particle is moving along a curve that its position at time *t* is $(x(t), y(t))$. At time $t = 2$, the particle is at position (1,5). It is known that $\frac{dx}{dt} = \frac{\sqrt{t+2}}{e^t}$ and $\frac{dy}{dt} = \sin^2 t$. Find the speed of the particle at time $t = 4$. Find the distance traveled by the particle from time $t = 2$ to $t = 4$.