MAT 137 (Calculus II) Prof. Swift

Quiz 8, Parametric Curves and Arc Length Name: Key

For this quiz, you *may* work with other people, and you *may* consult your notes. You may *not* use the internet. You may leave the class after you turn in your quiz.

For this page, a particle moves in the plane with position $x = 3\cos(t)$ and $y = 2\sin(t)$.

1. Find the speed of the particle at time t. Denote the speed as $v(t)$, following the physics convention even though the speed is the *magnitude* of the velocity.

$\vec{v} = \left\langle \frac{dx}{dt}, \frac{dy}{dt} \right\rangle = \langle -3\sin(t), 2\cos(t) \rangle$

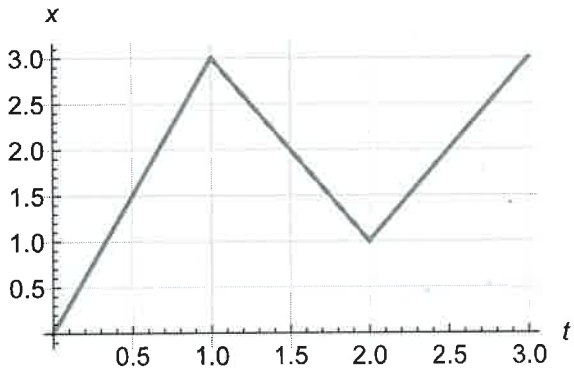
So $\boxed{v(t) = \sqrt{9\sin^2(t) + 4\cos^2(t)}}$

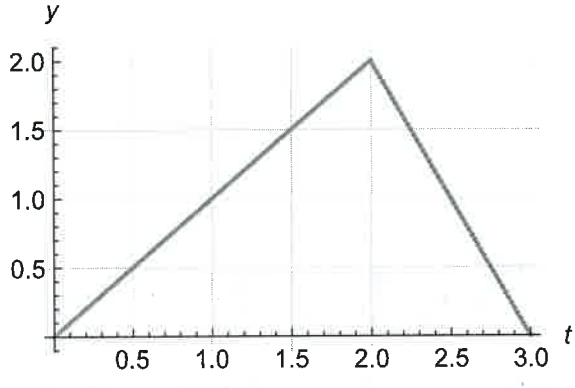
2. Write a definite integral for the distance traveled by the particle in the time interval $0 \le t \le 2\pi$. Note that this is also the perimeter of an ellipse.

Distance traveled = Perimeter = $\int_0^{2\pi} \sqrt{9\sin^2(t) + 4\cos^2(t)}\, dt$

(This is NOT an elementary integral.)

3. The top two figures show the graphs of $x = f(t)$ and $y = g(t)$. On the bottom figure, sketch the parametric curve traced out for $0 \leq t \leq 3$ in the $x - y$ plane.





t	x	y	(x, y)
0	0	0	(0,0)
1	3	1	(3,1)
2	1	2	(1,2)
3	3	0	(3,0)