AP Calculus BC – Review #2 Parametric and Polar

Find dy/dx, d²y/dx², the equation of the tangent line at the given value, and describe the concavity at the given value.

1. $x = t^2 - 1$, $y = \dfrac{1}{t} + 1$ at (3, 3/2)

2. $x = 2 + \sec(t)$, $y = 1 + 2\tan(t)$ at $t = \pi/6$

3. $x = t^2 + 3t$, $y = 2t + 3$ at (4, 5)

4. $x = \sqrt{t}$, $y = 4t^2 - 1$ at (2, 63)

Find all rectangular points of horizontal and vertical tangents.

4. $x = t^2 - t + 2$, $y = t^3 - 3t$

5. $r = 1 - \cos\theta$

6. $r = 3\sin\theta$

Find the arc length:

7. $x = t^2$, $y = 4t^3 - 1$ on [-1, 1]

8. $x = e^{-t}\cos t$, $y = e^{-t}\sin t$ on $[0, \pi/2]$

9. The position of an object is given by $\langle 4(1 - \sin t), 4(t + \cos t) \rangle$ feet.

    a) Find the velocity and acceleration vector.

    b) Find the speed at $t = 2\pi/3$

    c) Find the total distance traveled from $t = 1$ to $t = 3$.

10. Find the velocity vector and the position vector if $a(t) = \langle 1, e^{-t} \rangle$, $v(0) = \langle 2, 1 \rangle$, and the object is at (1,1) when $t = 0$.

    b) Find the position at $t = 2$.

Find the area of the following regions:

11. One petal of $r = 3\cos 5\theta$

12. Outside $r = 1 - \sin\theta$ and inside $r = 3\sin\theta$

13. Between the inner and outer loops of $r = 2 - 4\cos\theta$

2012 Short Answer BC exam #2 (calculator active)

    For $t \geq 0$, a particle is moving along a curve so 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 $\dfrac{dx}{dt} = \dfrac{\sqrt{t+2}}{e^t}$ and $\dfrac{dy}{dt} = \sin^2 t$.

    a) Is the horizontal movement of the particle to the left or to the right at time t = 2? Explain your answer. Fid the slope of the path of the particle at time t = 2.

    b) Find the x-coordinate of the particle's position at time t = 4.

    c) Find the speed of the particle at time t = 4. Find the acceleration vector of the particle at time t = 4.

    d) Find the distance traveled by the particle from time t = 2 to t = 4.