AP Calculus BC **Name: _____**
Unit 11 – REVIEW

1. For time t > 0, the position of a particle moving in the xy-plane is given by the parametric equations $x(t) = 4t + t^2$ and $y(t) = \frac{1}{3t+1}$. What is the acceleration vector of the particle at t = 1?

2. Find the area of the common interior of the polar curves $r = 4\cos\theta$ and $r = 2$.

3. Write an equation for the line tangent to the polar curve $r = 2\theta$ at $\theta = \frac{\pi}{2}$.

4. Find the equation of the tangent to the curve defined by $x = \sqrt{t}$ and $y = \sqrt{t-1}$ when $t = 5$.

5. Find $\frac{d^2y}{dx^2}$ for the curve given by $x = \frac{1}{2}t^2$ and $y = t^2 + t$.

6. Find all points of vertical tangency to the curve given by $x = \cos\theta$ and $y = 4\sin\theta$.

7. Find the total distance a particle travels along a path by $x = t^2 + 1$ and $y = 4t + 3$ on the interval $-1 \le t \le 0$.

8. The position of a particle in the xy-plane is given by (x(t), y(t)), with $\frac{dy}{dt} = t^2 + \cos(3t^2)$. At t = 0, the particle is at the point (3, 1). Find the y-coordinate of the particle at t = 3.

9. A particle follows a path defined parametrically by $x(t) = 2\sqrt{t-3}$ and $y(t) = 3t^2$. What is the speed of the particle at t = 9?

10. Find the area of the region enclosed by the graph of $x = \sin\theta, y = \sin^2\theta$, the x-axis, and the vertical line x = 1.

11. Find $\frac{dy}{dx}$ for $r = 3(1-\cos\theta)$ at $\theta = \pi$.

12. Find the tangents at the pole for the polar curve $r = 2\cos 3\theta$.

13. Find the perimeter of one petal of the rose curve $r = 4\sin(3\theta)$.

14. Find the points of intersection of the graphs of $r = 2 - 3\cos\theta$ and $r = \cos\theta$.

15. Find the area of the common interior region of $r = 4\sin\theta$ and $r = 2$.