

FRQ #8 (Calculator) – Parametric, position/velocity/acceleration, tangent lines, arclength/total distance traveled

AP[®] Calculus BC 2022 Free-Response Questions

2. A particle moving along a curve in the xy -plane is at position $(x(t), y(t))$ at time $t > 0$. The particle moves in such a way that $\frac{dx}{dt} = \sqrt{1+t^2}$ and $\frac{dy}{dt} = \ln(2+t^2)$. At time $t = 4$, the particle is at the point $(1, 5)$.
- (a) Find the slope of the line tangent to the path of the particle at time $t = 4$.
 - (b) Find the speed of the particle at time $t = 4$, and find the acceleration vector of the particle at time $t = 4$.
 - (c) Find the y -coordinate of the particle's position at time $t = 6$.
 - (d) Find the total distance the particle travels along the curve from time $t = 4$ to time $t = 6$.