

9. Parametric Equations, Polar Coordinates, and Vector-Valued Functions

Starter Quiz · 课前小测

AP Calculus BC

Name: _____ Score: _____

1. For a parametric curve, $\frac{dy}{dx} =$

☐ $\frac{dy/dt}{dx/dt}$

☐ $\frac{dx/dt}{dy/dt}$

☐ $\frac{dy}{dt} \cdot \frac{dx}{dt}$

☐ $\frac{d}{dt} \left[\frac{y}{x} \right]$

2. The parametric second derivative $\frac{d^2y}{dx^2}$ equals...

☐ $\frac{d^2y/dt^2}{d^2x/dt^2}$

☐ $\frac{\frac{d}{dt}(dy/dx)}{dx/dt}$

☐ $\frac{dy/dt}{dx/dt}$

☐ $\frac{d^2y}{dt^2}$

3. The arc length of a parametric curve is $\int_a^b (?) dt$ where the integrand is...

☐ $\sqrt{1 + (dy/dx)^2}$

☐ $\sqrt{(dx/dt)^2 + (dy/dt)^2}$

☐ $(dx/dt) + (dy/dt)$

☐ $\sqrt{(dx/dt)^2 - (dy/dt)^2}$

4. To differentiate $\mathbf{r}(t) = \langle x(t), y(t) \rangle$, you...

☐ multiply the components

☐ differentiate each component separately

☐ add the components then differentiate

☐ take the magnitude first

5. To integrate $\langle f(t), g(t) \rangle$, you...

- ☐ integrate each component separately
- ☐ multiply the components
- ☐ take the magnitude
- ☐ differentiate instead

6. For $\mathbf{v}(t) = \langle 2t, 3 \rangle$, find the speed at $t = 2$.

7. For $x = t^2$, $y = t^3$, $\frac{dy}{dx} = \frac{3t}{2}$. Find the slope at $t = 2$.

8. The parametric second derivative equals $\frac{d^2y/dt^2}{d^2x/dt^2}$.

- ☐ True ☐ False

9. The parametric arc-length integrand equals the point's _____.

10. Integrating a vector function introduces a constant vector $\mathbf{C}$.

- ☐ True ☐ False

AP Calculus BC

1. $\frac{dy/dt}{dx/dt}$

Top over bottom: $\frac{dy/dt}{dx/dt}$.

2. $\frac{\frac{d}{dt}(dy/dx)}{dx/dt}$

Differentiate $\frac{dy}{dx}$ in t , then divide by $\frac{dx}{dt}$.

3. $\sqrt{(dx/dt)^2 + (dy/dt)^2}$

Both derivatives squared, added, under a root.

4. **differentiate each component separately**

$$\mathbf{r}' = \langle x', y' \rangle.$$

5. **integrate each component separately**

Integrate componentwise, plus a constant vector.

6. **5**

$$\sqrt{4^2 + 3^2} = 5.$$

7. **3**

$$\frac{3(2)}{2} = 3.$$

8. **False**

That naive ratio is wrong.

9. **speed**

Integral of speed = distance.

10. **True**

One constant per component, bundled into $\mathbf{C}$.