

AP Calculus BC

Chapter 10 Test 1 Review Outline

Parametric Equations

- Basic Graphing
- Rewriting parametric equations in Cartesian coordinates (eliminate the parameter)
- Derivative: $\frac{dy}{dx} = \frac{y'(t)}{x'(t)}$; find slope/equation of tangent/normal lines
- Second Derivative: $\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{dy}{dx}\right)}{x'(t)}$
- Length of a curve: $L = \int_a^b \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$
- Surface Area
 - Rotate around x - axis: $SA = 2\pi \int_a^b y(t) \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$
 - Rotate around y - axis: $SA = 2\pi \int_a^b x(t) \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$

Vectors

- Component Form: $\vec{v} = \langle v_1, v_2 \rangle = v_1\mathbf{i} + v_2\mathbf{j}$
- Magnitude of a vector: $|\vec{v}| = \sqrt{v_1^2 + v_2^2}$
- Dot Product:
 - $\vec{u} \cdot \vec{v} = u_1v_1 + u_2v_2 = |\vec{u}||\vec{v}|\cos\theta$
 - $\theta = \cos^{-1}\left(\frac{\vec{u} \cdot \vec{v}}{|\vec{u}||\vec{v}|}\right) = \cos^{-1}\left(\frac{u_1v_1 + u_2v_2}{|\vec{u}||\vec{v}|}\right)$
 - θ = the angle between the vectors
- Unit Vector:
 - $\frac{\vec{u}}{|\vec{u}|}$
 - Magnitude = 1
- Vector Valued Functions
 - Position: $\vec{r}(t) = \langle x(t), y(t) \rangle$
 - Velocity: $\vec{v}(t) = \langle x'(t), y'(t) \rangle$
 - Acceleration: $\vec{a}(t) = \langle x''(t), y''(t) \rangle$
 - Speed = $|\vec{v}(t)|$; Direction = $\frac{\vec{v}}{|\vec{v}|}$
 - Total Distance Traveled = $\int |\vec{v}(t)| dt = \int_a^b \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$
 - Final Position = Initial Position + Displacement (integral of velocity)
 - Integrals of Vector Valued Functions

AP Calculus BC

Chapter 10 Test 1 Review Outline

Parametric Equations

- Basic Graphing
- Rewriting parametric equations in Cartesian coordinates (eliminate the parameter)
- Derivative: $\frac{dy}{dx} = \frac{y'(t)}{x'(t)}$; find slope/equation of tangent/normal lines
- Second Derivative: $\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{dy}{dx}\right)}{x'(t)}$
- Length of a curve: $L = \int_a^b \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$
- Surface Area
 - Rotate around x - axis: $SA = 2\pi \int_a^b y(t) \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$
 - Rotate around y - axis: $SA = 2\pi \int_a^b x(t) \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$

Vectors

- Component Form: $\vec{v} = \langle v_1, v_2 \rangle = v_1\mathbf{i} + v_2\mathbf{j}$
- Magnitude of a vector: $|\vec{v}| = \sqrt{v_1^2 + v_2^2}$
- Dot Product:
 - $\vec{u} \cdot \vec{v} = u_1v_1 + u_2v_2 = |\vec{u}||\vec{v}|\cos\theta$
 - $\theta = \cos^{-1}\left(\frac{\vec{u} \cdot \vec{v}}{|\vec{u}||\vec{v}|}\right) = \cos^{-1}\left(\frac{u_1v_1 + u_2v_2}{|\vec{u}||\vec{v}|}\right)$
 - θ = the angle between the vectors
- Unit Vector:
 - $\frac{\vec{u}}{|\vec{u}|}$
 - Magnitude = 1
- Vector Valued Functions
 - Position: $\vec{r}(t) = \langle x(t), y(t) \rangle$
 - Velocity: $\vec{v}(t) = \langle x'(t), y'(t) \rangle$
 - Acceleration: $\vec{a}(t) = \langle x''(t), y''(t) \rangle$
 - Speed = $|\vec{v}(t)|$; Direction = $\frac{\vec{v}}{|\vec{v}|}$
 - Total Distance Traveled = $\int |\vec{v}(t)| dt = \int_a^b \sqrt{[x'(t)]^2 + [y'(t)]^2} dt$
 - Final Position = Initial Position + Displacement (integral of velocity)
 - Integrals of Vector Valued Functions