Parametrics Quiz Topics

- Graphing
- Eliminating the Parameter
- Converting rectangular to parametric
- Solving applications
  - Velocity/distance
  - ferris wheel
- Derivatives of parametrics
- Area under parametrics curve

$$A = \int_a^b y\,dx$$

- Arc length

$$L = \int_\alpha^\beta \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\,dt$$

$$x = t + 1 \qquad x = t^2 + 2$$

$$y = t^2 \qquad y = t$$

$$t = x - 1 \qquad x = y^2 + 2$$

$$y = (x-1)^2$$

$$\cancel{x - 2 = y^2}$$

$$\cancel{y = \sqrt{x-2}}$$

$$x = 3\cos\theta \rightarrow \frac{x^2}{9} = \frac{9}{9}\cos^2\theta$$

$$y = 4\sin\theta \longrightarrow \frac{y^2}{16} = \frac{16}{16}\sin^2\theta$$

$$\frac{x^2}{9} + \frac{y^2}{16} = \cos^2\theta + \sin^2\theta$$

$$\frac{x^2}{9} + \frac{y^2}{16} = 1$$

$y = x^2 - 4$

$x = t$

$y = t^2 - 4$

$x^2 + y^2 = 16$

$\frac{x^2}{16} + \frac{y^2}{16} = 1$

$\frac{x^2}{16} + \frac{y^2}{16} = \cos^2\theta + \sin^2\theta$

$\frac{x^2}{16} = \cos^2\theta \rightarrow x = 4\cos\theta$

$y = 4\sin\theta$

$$x = vt\cos\theta$$

$$y = h + vt\sin\theta - \frac{1}{2}\underbrace{g}_{\text{gravity}}t^2$$

$$x = r\sin\left(\frac{\pm 2\pi t}{\text{seconds}}\right)$$

$$y = h - r\cos\left(\frac{\pm 2\pi t}{\text{seconds}}\right)$$

$\frac{dx}{dt}$

find equation of line when

$\frac{dy}{dt}$

$t = ?$

$\frac{dy}{dx}$

point-slope form $y - y_1 = m(x - x_1)$

$x = t^2 - 4 \rightarrow dx = 2t\,dt$

$y = t$

$0 \le t \le 4$

find area

$A = \int_0^4 y\,dx$

$A = \int_0^4 t(2t)\,dt = \int_0^4 2t^2\,dt = \frac{2t^3}{3}\Big|_0^4$

$\frac{2(4)^3}{3} - \frac{2(0)^3}{3} = \frac{128}{3}$

$x = 4\cos t$

$y = 4\sin t$

$0 \leq t \leq \pi$

find area

$dx = -4\sin t\, dt$

$$\int_0^{\pi} 4\sin t(-4\sin t)\, dt = \int_0^{\pi} -16\sin^2 t\, dt$$

$$= -16\int_0^{\pi} \sin^2 t\, dt = -16\int_0^{\pi} \frac{1-\cos 2t}{2}\, dt$$

$x = 2\cos^2 t$ $\qquad dx = -4\cos t \sin t \, dt$

$y = 2\cos t \sin t$ $\qquad dy = -2\sin^2 t + 2\cos^2 t \, dt$

$0 \leq t \leq \pi$

$$\boxed{\int_0^{\pi} \sqrt{(-4\cos t \sin t)^2 + (-2\sin^2 t + 2\cos^2 t)^2} \, dt}$$