Welcome to the Weekly Review for MATH 2414. This week’s review talks about Parameteric Equations. We would like to thank Patrick Bourque and the Spring 2015 MATH 2414 students for allowing us to film the Weekly Reviews.

The following problems are presented in the Week 9 videos. Thank you!

**Part A: Eliminating the Parameter and Sketching**

1. Eliminate the parameter and sketch $x = t + 1$ and $y = t^2 + 2t + 5$.

2. Eliminate the parameter and sketch $x = 3 + \cos(t)$ and $y = 2 - 4\sin(t)$.
3. Eliminate the parameter and sketch \( x = 3 \cos(t) \) and \( y = 3 \sin(t) \).

4. Eliminate the parameter and sketch \( x = \sqrt{t} \) and \( y = \sqrt{9-t} \).
5. Eliminate the parameter and sketch \( x = -\sqrt{9 - e^{2t}} \) and \( y = e^t \).

6. Eliminate the parameter and sketch \( x = \frac{\sqrt{9t^2-1}}{|t|} \) and \( y = \frac{1}{t} \).
Part B: Differential Calculus

1. Background Information

2. Find \( \frac{dy}{dx} \) and \( \frac{d^2y}{dx^2} \) given \( x = \cos^4(t) \) and \( y = \sin^4(t) \)

3. Find \( t \) where there are vertical tangencies and horizontal tangencies for \( x = 2t^3 - 9t^2 + 12t \) and 
   \( y = t^3 - 6t^2 + 9t \)
Part C: Integral Calculus

1. Area

2. Find the area under the curve of \( x = \ln(1 + t^6) \) and \( y = \frac{1}{6t^3} \) from \( t = 1 \) to \( t = 2 \).
3. Arc Length

4. Find the arc length given 

\[ x = t \quad \text{and} \quad y = \frac{1}{10} t^5 + \frac{1}{6} t^{-3} \]

from \( t = 1 \) to \( t = 2 \).
5. Find the arc length given $x = \arcsin(t)$ and $y = \frac{1}{2} \ln(1 - t^2)$ from $t = 0$ to $t = \frac{1}{2}$. 
7. Find the Surface Area rotated about the $y$-axis given $x = t$ and $y = \frac{1}{4}t^2 - \frac{1}{2}\ln(t)$ from $t = 1$ to $t = 2$. 