Math 1232: Single-Variable Calculus 2
George Washington University Spring 2026
Recitation 14

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Problem 1. Consider the curve $\vec{r}(t) = \left(\frac{t}{1+t}, \ln(1+t)\right)$.

(a) At what time does this curve pass through the origin?

(b) Does this curve hit the point $(2, \ln(3))$?

(c) Does it hit the point $(1/2, \ln(2))$?

(d) Try to sketch a graph of this curve. What do you know about it?

(e) Find a parametric equation for the tangent line to the curve at the time $t = 3$. Find an implicit equation for the same line.

(f) Set up an integral to compute the length of the curve for $0 \leq 2 \leq 2$?

Problem 2. Let $\vec{r}(t) = (\cos^3(t), \sin^3(t))$.

(a) Find the length of the curve for $0 \leq t \leq 2$.

(b) Did you get zero? Does that make any sense?

(c) Where did that go wrong? Can you fix it?

Problem 3. Consider the polar curve $r = e^\theta$.

(a) Sketch a graph of this curve.

(b) At what points (r, θ) does this intersect the x-axis?

(c) What are the Cartesian coordinates of the point where $\theta = 4\pi/3$?

(d) Can we write this curve as a parametric equation?

(e) Find the points (r, θ) where the tangent line is horizontal.

(f) Find the points (r, θ) where the tangent line is vertical.

Problem 4. (a) Find the area under the curve $\vec{r}(t) = (\cos(t), e^t)$ and above the line $y = 1$ for $x \geq 0$.

(b) Find the area enclosed by one petal of $r = 3\cos(2\theta)$.