Math 252: Quiz 10 **23 Apr 2026**

Name: _____ / **25**

30 minutes. No aids (book, notes, calculator, internet, etc.) are permitted. Show all work and use proper notation for full credit. Put answers in reasonably-simplified form. 25 points possible.

1. [8 points] Write the MacLaurin Series of each function.

a. $f(x) = (1+x^2)^{1/3}$

b. $\cosh(x) = \dfrac{e^x + e^{-x}}{2}$. Express your answer as **one series**.

2. [8 points] Consider the parametric equations $x = 2t^2, \quad y = t^4 + 1, \quad t \in [0, 2]$.

a. Eliminate the parameter and sketch the graph.

b. Find $\dfrac{d^2y}{dx^2}$ using the result of part **a**.

c. Find $\dfrac{d^2y}{dx^2}$ using the parametric formula, and check that it gives the same result as in part **b**.

3. [9 points] Consider the parametric equations $x = t - \sin t, \quad y = 1 - \cos t, \quad t \in [0, 2\pi]$.

a. Find the equation of the tangent line at $t = \frac{\pi}{2}$.

b. Set up (but do not evaluate) an integral for the area under the parametric curve.

c. Set up (but do not evaluate) an integral for the arc length of the parametric curve.

Extra Credit. [1 point] Evaluate the integral in **Problem 3 c.**

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