Quiz 2 Questions
Show all work clearly.
No calculator usage or software / program assistance.

THERE ARE 2 PAGES IN TOTAL:

- 1 page of problems (4 Problems in total)

- 1 page of given information

Problem 1. Consider the curve given parametrically by $x = t^3 - 3t$ and $y = t^2 - 9$

(a : 10 points) Calculate $\dfrac{dy}{dt}$, $\dfrac{dx}{dt}$, $\dfrac{dy}{dx}$, and $\dfrac{d^2y}{dx^2}$ of this curve.

(b : 6 points) Determine the location of all vertical and horizontal tangent lines.

(c : 6 points) Determine where the curve is concave up and concave down.

(d : 6 points) Sketch the graph

Problem 2. Plot the following **polar coordinates** (label each point with the part it's associated with if you use 1 graph):

(a : 2 points) $\left(2, \dfrac{\pi}{4}\right)$

(b : 2 points) $\left(-1, \dfrac{3\pi}{4}\right)$
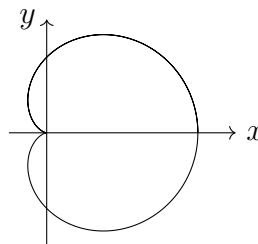
(c : 2 points) $\left(1, \dfrac{-5\pi}{6}\right)$

Problem 3. (6 points) Convert the polar equation $r = 1 + \cos\theta$ into a Cartesian (x, y)-equation.

Problem 4.

Consider the polar graph

$$r = 1 + \cos\theta.$$

An accurate picture is provided to the right.

(a : 6 points) Setup the integral associated with its area in the **1st quadrant**.

(b : 4 points) How would you solve this integral? Explain your reasoning. If you are unsure on what to write, do the first few steps.

List of Given Information

1. Pythagorean Identities

    (a) $\sin^2(x) + \cos^2(x) = 1$

    (b) $\tan^2(x) + 1 = \sec^2(x)$

    (c) $1 + \cot^2(x) = \csc^2(x)$

2. Double Angle Identities

    (a) $\sin(2x) = 2\sin x \cos x$

    (b) $\cos(2x) = \cos^2(x) - \sin^2(x)$

3. Half-Angle Identities

    (a) $\sin^2(x) = \dfrac{1 - \cos(2x)}{2}$

    (b) $\cos^2(x) = \dfrac{1 + \cos(2x)}{2}$

4. Trig-Integrals

    (a) $\displaystyle \int \sec x \, dx = \ln|\sec x + \tan x| + C$

    (b) $\displaystyle \int \tan x \, dx = \ln|\sec x| + C$

    (c) $\displaystyle \int \csc x \, dx = \ln|\csc x - \cot x| + C$

    (d) $\displaystyle \int \cot x \, dx = \ln|\csc x| + C$