Quiz 2 REview

Problem 1. For each parametric system.

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

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

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

(d) Sketch the graph

(i : # points) $x = 2t^3 + 3t$ and $y = 4t - 5t^2$

(ii : # points) $x = t - \ln t$ and $y = t^2 - t^{-2}$

(iii : # points) $x = te^t$ and $y = t + \sin t$

Problem 2. Write down the arc length integral for:

(a : # points) $x = 2t^3 + 3t$ and $y = 4t - 5t^2$ on $[0, 1]$

(b : # points) $x = t - \ln t$ and $y = t^2 - t^{-2}$ on $[1, e]$

(c : # points) $x = te^t$ and $y = t + \sin t$ on on $[0, \pi]$

Problem 3. Set and/or solve the area integral for

- $r = 2 + \sin 4\theta$
- $r = 1 + 5\sin 6\theta$
- $r = 4\cos 3\theta$

Problem 4. Convert the following polar points or equations into Carteasian coordinates

(a : w points) $(1, \frac{\pi}{4})$

(b : w points) $(-2, \frac{3\pi}{2})$

(c : w points) $r = 5\sec\theta$

(d : w points) $\theta = \frac{\pi}{3}$

(e : w points) $r^2\cos(2\theta) = 1$

Convert the following Carteasian equations into polar:

(a : x points) $x^2 + y^2 = 7$

(b : x points) $y = -2x^2$

(c : x points) $x^2 + y^2 = 4y$

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