Maple Assignment #1

Chapter 10 "*Parametric Equations and Polar Coordinates*"

Name: **ID#:** **Sec#:**

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> restart:
> with(plots):
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Warning, the name changecoords has been redefined

Problem # 1: The parametric equations $f(t) = x1 + (x2 - x1)\, t$ and $g(t) = y1 + (y2 - y1)\, t$, where t in $[0, 1]$, describes the line segment from $P(x1, y1)$ to $Q(x2, y2)$. Use the follwoing three points P(-1,-1), Q(4,2), and R(1,5) to define three set of parametric equations such that the three line segments form a triangle. Plot the triangle and use animation to show how this triangle is being drawn.

NOTE: You can display three graphs using the following commands:
Plot1:=plot([f1(t),g1(t),t=0..1]):
similarly for Plot2 and Plot3 and then use display command to show the three graphs.

For animation, you can define three animation plots using
AnimPlot1:=animatecurve([f1(t),g1(t),t=0..1],frames=200):
similarly for AnimPlot2 and AnimPlot3 and then use display command to show the animation of the three graphs.

Problem # 2: Find parametric equations for the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, use these equations to plot the ellipse for a = 4, and b = 1, b = 2, b = 4, b = 6, and b = 8. Explain how does the shape of the ellipse varies as value of b changes. Plot these graphs in different windows. Size of each window should not be more than 3 by 3 inches.

Problem # 3: Suppose position of one particle is given by $x1 = a \sin(t)$ $y1 = b \cos(t)$, t in $[0, 2\pi]$ and the position of a second particle is given by $x2 = -3 + \cos(t)$ $y2 = 1 + \sin(t)$, t in $[0, 2\pi]$. Plot these two graphs in the same window for a = 3 and b = 2. Write how many points of ntersections are there? What difference do you see if a = 2 and b = 3. Animate these two curves and find if there is any collision point, a point where two graphs intersect for the same value of t. For plotting and Animating two graps in the same window, use technique given in the NOTE above.

Problem # 4: Sketch graph of the curve $x(t) = \cos(t) + \log\left(\tan\left(\frac{t}{2}\right)\right)$ $y(t) = \sin(t)$, t in $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$.
Also find its length. (If you get a strange answer, use evalf(%); command to get its numerical value.)

Problem # 5: Find area of surface of revolution obtained by rotating the curve $x(t) = 3t - t^3$, $y(t) = 3t^2$, t in $[0, 1]$.

Problem # 6: Find area of surface of revolution obtained by rotating the curve $x(t) = t + t^3$, $y(t) = t - \frac{1}{t^2}$, t in $[0, 2]$.(If you get a strange answer, use evalf(%); command to get its numerical value.)

Problem # 7: Plot the two polar curves $r1 = 1 + \sin(t)$, and $r2 = 1 + \sin\left(t - \frac{\pi}{3}\right)$ in the same window. Write how first graph is related to the second graph.

Problem # 8: Plot the polar curves $r = \mathbf{e}^{\sin(t)} - 2\cos(4t)$.

Problem # 9: Plot the two polar curves $r1 = 1 + \cos(t)$, and $r2 = 3\cos(t)$ in the same window. Find point of intersection of the two curves using "solve(r1(t)-r2(t)=0,t)" and find the area that lies inside both curves.

Problem # 10: Plot the two polar curves $r1 = \sin(2t)$, and $r2 = \sin(t)$ in the same window. Find point of intersection of the two curves using "solve(r1(t)-r2(t)=0,t)" and find the area that lies inside both curves.