Math 143 Midterm 2

Name: _____

Identities: $\cos^2 t = (1 + \cos 2t)/2, \sin^2 t = (1 - \cos 2t)/2.$

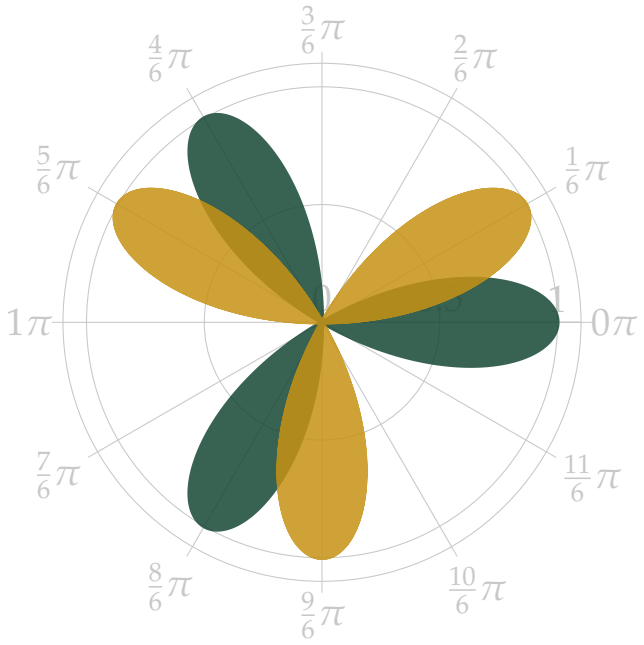
1. Find the arclength of the curve given by the parametric equations $\begin{cases} x = \cos(2t), \\ y = 2t - \sin(2t) \end{cases}$ for $t \in [0, \pi]$.

2. Find the values of t for which the parametric curve $\begin{cases} x = 2t^2 \\ y = t^4 - t^3/3 \end{cases}$ for $t \in \mathbb{R}$ is concave down.

3. Find the plane containing the lines $\begin{cases} x = 2 + t, \\ y = 1 + t, \\ z = -2 + 2t \end{cases}$ for $t \in \mathbb{R}$ and $\begin{cases} x = s, \\ y = 1 + s, \\ z = 1 + 2s \end{cases}$ for $s \in \mathbb{R}$.

4. Find the equation of the line tangent to the polar curve $r = 1/(1 + \cos\theta)$ at $\theta = \pi/2$.

5. Set up an integral (or integrals) that give the area inside the polar curve $r = \cos(3\theta)$ but outside the polar curve $r = \sin(3\theta)$. Do not evaluate the integrals, just set the integrals up!



6 (Bonus!). Write $m \in \mathbb{R}$. If there is a unique maximum among the numbers written down by all students, then the student who wrote m will earn $\frac{100}{m}\%$ extra credit.