MOCK MIDTERM

PEYAM RYAN TABRIZIAN

Instructions: This is a mock midterm, designed to give you some practice for the actual midterm. It will be similar in length and in spirit to the actual midterm, but do **NOT** expect the questions on the midterm to be the same; some will be easier, some will be harder. So please also look at the study guide and the suggested homework for a more complete study experience!

1		15
2		20
3		15
4		20
5		15
6		15
Total		100

Date: Friday, May 4, 2018.

1. *(15 points)* Find the equation of the tangent line of $r = 1 + 2\cos(\theta)$ at $\theta = \frac{\pi}{3}$.

2. *(20 points, 4 points each)* For each of the following surfaces, put the name and draw a small sketch of the figure. It's ok if it's not drawn to scale, but the direction needs to be correct.

   (a) $x^2 + 2y^2 - 3z^2 = 4$

   (b) $x^2 - y^2 + z^2 = 0$

   (c) $z = 3y^2 - 5x^2$

   (d) $2x^2 - 5y^2 - 6z^2 = -2$

   (e) $x = y^2 + z^2$

3. *(15 points)* Find parametric equations of the tangent line to the curve

$$\mathbf{r}(t) = \left\langle e^{-t}\cos(t), e^{-t}\sin(t), e^{-t} \right\rangle$$

at the point $(1, 0, 1)$.

4. *(20 points, 10 points each)* **Note:** Here I put 2 sub-parts just to give you more practice; a more reasonable exam question like that would only have one sub-part.

   (a) Find the equation of the plane containing the point $(2, 0, -3)$ and the line L with equation:

$$\begin{aligned} x(t) =& 1 + t \\ y(t) =& 3 + 2t \\ z(t) =& - t \end{aligned}$$

(b) Find the equation of the plane containing the lines L_1 and L_2 with equations

$$\begin{aligned} x(t) =& 2 - t \\ y(t) =& 3 + 2t \\ z(t) =& 4 - 3t \end{aligned}$$

and

$$\begin{aligned} x(t) =& 1 + t \\ y(t) =& 2 + t \\ z(t) =& 5 - t \end{aligned}$$

5. *(15 points)* Use polar coordinates to find the following limit:

$$\lim_{(x,y)\to(0,0)} \frac{e^{-(x^2+y^2)}-1}{x^2+y^2}$$

6. *(15 points)* Find the equation of the tangent plane to the function $z = \sin(xy)$ at the point $(2\sqrt{\pi}, \frac{1}{2}\sqrt{\pi})$