

Math 243
Summer 2018
Practice Exam 1
Doomsday

Name (Print): _____

Time Limit: Probably Not Enough

Problem	Points	Score
1	15	
2	20	
3	30	
4	15	
5	15	
6	20	
7	20	
Total:	135	

1. (15 points) Let $P = (1, 2, 3)$ and $Q = (0, -1, 2)$.

a) Find the distance between P and Q .

b) Give the equation of a sphere, centered at P , that has the point Q on its surface.

c) Find the vector \overrightarrow{PQ} .

2. (a) (10 points) The following points define the vertices of a triangle $A = (0, 0)$, $B = (1, 3)$ and $C = (2, 7)$. Find the measure of angle B .

- (b) (10 points) Let $u = i + j$, $v = i + j + k$. Find the projection of u onto $u + v$.

3. (a) (10 points) The vectors $u = 1i + 2j$ and $v = j + 3k$ lie in a plane. Give an equation of the plane that goes through the point $P = (1, 0, 1)$ and is parallel to the aforementioned plane.
- (b) (10 points) Give the equation of a line, perpendicular to the plane $2x + 3y + z = 6$, that goes through the point $(1, 0, 1)$.
- (c) (10 points) In part *b*) find the point in space the line hits the plane.

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4. (15 points) This page will be similar to problems 1-12 in 11.6.

5. (15 points) Consider the polar coordinate equations $r = 2(1 + \cos(\theta))$ and $r = \cos(\theta)$. Graph both of these, and find the arclength. Find the area between the two graphs. Note that this is non-standard...

6. (a) (10 points) Let $r(t) = t^2 i + (1 - 2t^2) j + 10 k$. Give the equation of the tangent line when $t = 2$.

- (b) (10 points) Find the arclength of the above from $t = 0$ to $t = 1$.

7. (20 points) Let $r(t) = t \cos(t) \mathbf{i} + t \sin(t) \mathbf{j} + t \mathbf{k}$. Describe this path in your own, freaky words. Find the unit normal vector, T , the curvature, κ , and the principle unit normal N . For extra credit, determine the unit binormal vector B .