

Math 175 Exam 1

Name(print):

Problem 1:	/15
Problem 2:	/20
Problem 3:	/15
Problem 4:	/15
Problem 5:	/10
Problem 6:	/25
Total:	/100

This is a paper-based exam. No calculator is allowed for this exam. To get full points, you must justify your answer(s).

1. (15 points) Given points $P(\sqrt{3}, \pi/2, \pi/6)$ (in spherical) and $Q(1, \pi/6, \sqrt{5})$ (in cylindrical coordinates). Find the area of the triangle formed by O, P and Q .

2. (20 points) Given the planes $2x + y - z = 0$ and $x + 2y + 3z = 3$.

(a) find the cosine of the angle between the two plane.

(b) find the vector equation of the intersecting line of the two planes.

3. (15 points) Show that the distance between the parallel planes $ax + by + cz + d_1 = 0$ and $ax + by + cz + d_2 = 0$ is

$$D = \frac{|d_1 - d_2|}{\sqrt{a^2 + b^2 + c^2}}.$$

4. (15 points) Using definition of derivatives of vector functions to prove the following formula:

$$\frac{d}{dt}[f(t)\vec{v}(t)] = f'(t)\vec{v}(t) + f(t)\vec{v}'(t).$$

5. (10 points) The parabola $z = 4y^2$, $x = 0$ is rotated about the z -axis. Write an equation of the resulting surface.

6. (25 points) Solve the following problems:

(a)

$$\vec{r}(t) = \cos t \vec{i} + 2t^2 \vec{j} + 3 \sin 2t \vec{k},$$

(i) find $\lim_{t \rightarrow 2} \vec{r}(t)$.

(ii) find $\vec{r}'(t)$.

(b)

$$\int \left(\frac{4}{t^2 + 2} \vec{j} + \frac{2t}{1 + t^2} \vec{k} \right) dt$$