

Review 2

1. Find the length of the curve:
 - (a) $x = 2t, y = 2t^{3/2}, 0 \leq t \leq 1.$
 - (b) $r = \theta^2, 0 \leq \theta \leq \frac{\pi}{2}.$
 - (c) $r = \cos^3(\theta/3), 0 \leq \theta \leq \frac{\pi}{2}.$
2. Find the area of the surface generated by revolving about x -axis of the curve $x = \cos^3 t, y = \sin^3 t, 0 \leq t \leq \frac{\pi}{2}.$
3. Sketch the graph and find the area of one leaf of:
 - (a) $r = \sin 3\theta.$
 - (b) $r^2 = \sin 2\theta.$
4. Find the area of the region:
 - (a) Inside $r = \cos 2\theta$ and outside $r = 2 \cos \theta.$
 - (b) Inside $r = 1$ and outside $r = 2 - 2 \cos \theta.$
5. Find equation of the following:
 - (a) Parabola with focus $(2, 1)$ and directrix $x = 0.$
 - (b) Hyperbola with vertexes $(0, 2)$ and $(2, 2)$ that passes through $(3, 3).$
6. Sketch the given conic and find foci, directrix, vertexes, asymptotes:
 - (a) $x^2 + 4y^2 - 2x - 8y + 1 = 0.$
 - (b) $9x^2 + 36x - 4y^2 - 24y - 36 = 0.$
7. Let $\bar{a} = 3\bar{i} + 2\bar{j} + \bar{k}, \bar{b} = \bar{i} + \bar{j} + \bar{k},$ and $\bar{c} = \bar{i} + 2\bar{j} + 3\bar{k}.$ Find $\bar{a} \cdot \bar{b}, \bar{a} \times \bar{b},$
 $\bar{a} \cdot (\bar{b} \times \bar{c}).$
8. Find the angle between vectors \bar{a} and \bar{b} as above.
9. Let $P = (0, 1, 0), Q = (1, 2, 3), R = (1, 1, 1).$ Find the area of the triangle $PQR.$
10. Find equation of the line that contains points $(1, 2, 3)$ and $(4, 5, 6).$
11. Find angle between lines:

$$\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3} \quad \text{and} \quad \frac{x-1}{1} = \frac{y-2}{1} = \frac{z-3}{1}.$$
12. Find distance from the point $(1, 1, 1)$ to the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}.$
13. Find equation of the plane that contains points $(0, 1, 0), (1, 2, 3), (1, 1, 1).$
14. Find distance from the point $(1, 1, 1)$ to the plane $2x + y + z + 1 = 0.$
15. Find equation of the line of intersection of the planes $2x + y + z + 1 = 0$
and $y + z - 5 = 0.$