MATH 1920, Fall 2017
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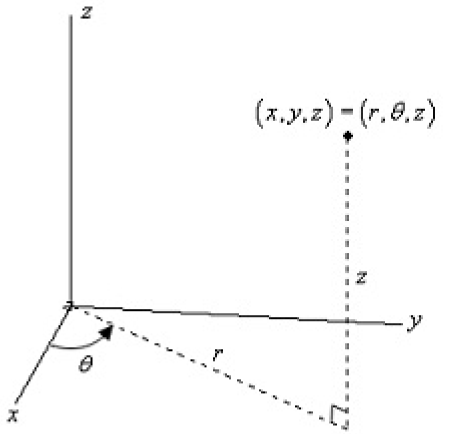
Sections: 201, 202

Name:__________________________

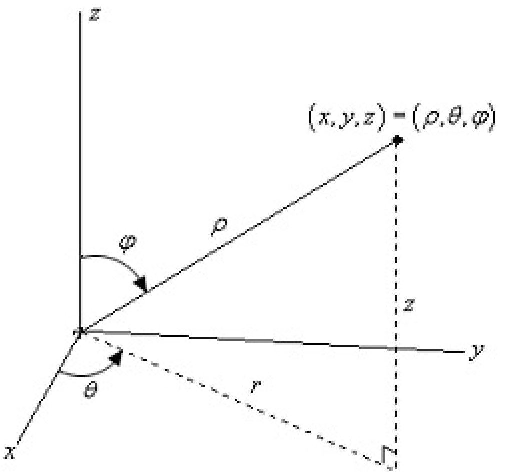
Section 13.6-14.2 Review

Brief Summary of 13.6-14.2 (see full summaries at the end of each section in the course textbook.)

- Use the figure below to create a table that describes conversion from rectangular (x, y, z) to cylindrical coordinates (r, θ, z) and vice versa.



- Use the figure below to create a table that describes conversion from rectangular (x, y, z) to spherical coordinates (ρ, θ, ϕ) and vice versa.



- Product rules:

$$\text{Scalar times vector: } \frac{d}{dt}(f(t)\boldsymbol{r}(t)) = \underline{\hspace{6cm}}.$$

$$\text{Dot product: } \frac{d}{dt}(\boldsymbol{r_1}(t) \cdot \boldsymbol{r_2}(t)) = \underline{\hspace{6cm}}.$$

$$\text{Cross product: } \frac{d}{dt}(\boldsymbol{r_1}(t) \times \boldsymbol{r_2}(t)) = \underline{\hspace{6cm}}.$$

- If $\boldsymbol{r'}(t_0)$ is nonzero, then it points in the direction ____________ to the curve at ______. The tangent line at $\boldsymbol{r}(t_0)$ has vector parametrization __________________.

Section 13.6 Additional Exercises

1. Describe the intersection of the horizontal plane $z = h$ and the hyperboloid $-x^2 - 9y^2 + 25z^2 = 1$. For which values of h is the intersection empty?

Section 13.7 Additional Exercises

1. Convert $(1, \frac{\pi}{2}, -2)$ from cylindrical to rectangular coordinates.

2. Convert $(1, \sqrt{3}, 7)$ from rectangular to cylindrical coordinates.

3. Sketch the set $r = \sin\theta$ described in cylindrical coordinates.

4. Convert $(3, 0, \frac{\pi}{2})$ from spherical to rectangular coordinates.

5. Convert $(1, 1, 1)$ from rectangular to spherical coordinates.

6. Convert $(2, 0, 2)$ from cylindrical to spherical coordinates.

Section 14.1-14.2 Additional Exercises

1. The function $\boldsymbol{r}(t) = \langle \sin t, 0, 4 + \cos t\rangle$ traces a circle. Determine the radius, center, and plane containing the circle.

In Exercises 2-4, find a parametrization of the curve.

2. The vertical line passing through the point $(3, 2, 0)$.

3. The circle of radius 2 with center $(1, 2, 5)$ in a plane parallel to the $yz-$plane.

4. The intersection of the surfaces $y^2 - z^2 = x - 2$, and $y^2 + z^2 = 9$ using $t = y$ as the parameter.

In exercises 5-7, let $\boldsymbol{r_1}(t) = \langle t^2, t^3, t \rangle$ *and* $\boldsymbol{r_2}(t) = \langle e^{3t}, e^{2t}, e^t \rangle$.

5. Find $\boldsymbol{r_1'}(t)$

6. Find $\frac{d}{dt}(\boldsymbol{r_1}(t) \cdot \boldsymbol{r_2}(t))$.

7. Find $\frac{d}{dt}(\boldsymbol{r_1}(t) \times \boldsymbol{r_2}(t))$.

8. Calculate $\frac{d}{dt}(\boldsymbol{r} \times \boldsymbol{r'})$, where $\boldsymbol{r}(t) = \langle t, t^2, e^t \rangle$.