Practice Problems on Sections 10.6 and 10.7 - ANSWERS

Section 10.6

Names of the surfaces and the descriptions are listed below. For the sketches ask in class.

1. Elliptic paraboloid; it is extended along the positive direction of the $x-$axis.

2. Hyperboloid of One Sheet; it is extended along the $x-$axis.

3. Cone; it is extended along the $x-$axis.

4. Hyperbolic paraboloid (saddle); the positive direction of the $y-$axis indicates the “top” of the “saddle.”

5. Ellipsoid centered at the origin with semi-axes 1, 1/2, and 1/3.

6. Cylinder extended along the $y-$axis; its cross-sections by the planes parallel to the $(x,z)-$plane are parabolas $x = -z^2$ (branches pointing in the negative direction of the $x-$axis) shifted 2 units in the positive direction of the $z-$axis, and 4 units in the positive direction of the $x-$axis.

7. Sphere (ellipsoid) centered at $(1, 2, 3)$ with radius $\sqrt{14}$ (with semi-axes $1/\sqrt{14}$, $1/\sqrt{14}$, $1/\sqrt{14}$)

8. Hyperboloid of One Sheet, extended along the $x-$axis, and shifted 1 unit in the positive direction of the $x-$axis, 2 units in the negative direction of the $y-$axis, and 3 units in the negative direction of the $z-$axis.

9. Cone, extended along the $x-$axis, and shifted 1 unit in the positive direction of the $x-$axis, 2 units in the negative direction of the $y-$axis, and 3 units in the negative direction of the $z-$axis.

10. Elliptic paraboloid, extended along the negative direction of the $z-$axis, and shifted 2 units in the positive direction of the $x-$axis, 1 unit in the positive direction of the $y-$axis, and 11 units in the positive direction of the $z-$axis.
Section 10.7

1. a) (i) \( x = -2t + 1, \quad y = \frac{1}{2}t + 2, \quad z = -8t + 2; \) (ii) \( \frac{x-1}{2} = 2(y - 2) = \frac{z-2}{-8}. \)

b) \(< \frac{1}{3}, \frac{\sqrt[3]{2} - \sqrt[3]{2}}{3}, \frac{2}{3}, \frac{2}{3} >\)

2. a) \( \vec{T}(t) = < \frac{1}{\sqrt{2}}, -\frac{\sin(3t)}{\sqrt{2}}, \frac{\cos(3t)}{\sqrt{2}} >\)

b) \( \vec{T}(\frac{\pi}{3}) = < \frac{1}{\sqrt{2}}, 0, -\frac{1}{\sqrt{2}} >\)