Math 2415

Friday Problem Session on 14.3-14.5, 16.6

1. 14.3.5
2. 14.3.11
3. 14.3.73
4. 14.3.76 (f)
5. 14.4.1.
6. 14.4.17
7. 14.5.1
8. 14.5.7
9. 14.5.13
10. **[Warm up for Paper Hwk 16.6 #1(c)]:**
    (a) Write down the equation of the form $F(x, y, z) = 0$ for the sphere of radius 2, center $(1, 2, 3)$.
    (b) Show that
    $$(x, y, z) = \mathbf{r}(\theta, \phi) = (1 + 2\sin\phi\cos\theta, 2 + 2\sin\phi\sin\theta, 3 + 2\cos\phi)$$
    is a parametrization of this sphere. **Hint:** Substitute the formulae for x, y, and z in terms of θ and ϕ into the function F you obtained in (a) and simplify as much as you can. What does this calculation tell you about where each of the points $(x, y, z) = \mathbf{r}(\theta, \phi)$ lie?
11. **[Parts of Paper Hwk 16.6 #3]:** Let S be the surface with parametrization
    $$(x, y, z) = \mathbf{r}(u, v) = u\cos v\,\mathbf{i} + u\sin v\,\mathbf{j} + u\,\mathbf{k} \qquad u \geq 0, \quad 0 \leq v \leq 2\pi.$$
    (a) Show that S is a cone. **Hint:** Find an equation of the form $F(x, y, z) = 0$ for this surface by eliminating u and v from the equations for x, y, and z above.
    (b) Find a parametrization of the tangent plane to the cone at the point where $(u, v) = (2, \pi/4)$.
12. **[Paper Hwk 16.6 #4a]:** Find a parametrization of that portion of the paraboloid $z = x^2 + y^2$ where $z \leq 4$. **Hint:** See blue paraboloid model.
13. 16.6.22 **Hint:** You could use a parametrization of the form $x = u$, $z = v$, and $y = f(u, v)$. In this case the parameters (u, v) must lie inside an ellipse. Describe this ellipse using inequalities.
14. 16.6.26. **Hint:** Choose the parameters to be polar coordinates (r, θ) so that $x = r\cos\theta$ and $y = r\sin\theta$. What range of values should you choose for r and θ?

15. 14.3.57
16. 14.3.74 (b,c) [(d) is a Challenge problem]
17. 14.5.15