Math 2513 homework

1. (due 8/31) 1.1 # 5, 9, 11, 13, 16, 17

2. (8/31) 1.2 # 5, 6, 12, 21, 28

3. (8/31) 1.3 # 5, 9, 10, 13, 14, 24 b), c), 31 a), e), 32 a)

4. (9/9) 1.4 # 5, 6, 19, 21-24, 26-28, 30

5. (9/9) 1.5 # 17, 18, 23, 24, 40, 42

6. (9/9) 1.5 # 27, 28, 29, 33, 39, 44

7. (9/16) 1.5 # 25-28, 32, 57

8. (9/23) 1.6 # 5-9, 12-17

9. (9/30) 1.7 # as many as needed of 1-4

10. (9/30) 1.7 # 14, 17c), 19-22, 37, 38

11. (9/30) 1.8 # 11, 15 (give explanations, of course), 17 (find different solutions from the book's. For 17a) and 17c), one can give a single formula that avoids the need to break into cases, by making use of the expression $|n - 1/4|$).

12. (9/30) Give formal proofs that the following functions are onto:

    (i) $f: \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 7x - 4$.
    (ii) $f: \mathbb{R} \times \mathbb{R} \times \mathbb{R} \to \mathbb{R}_{\geq 0}$ defined by $f(x, y, z) = x^2 + y^2 + z^2$.

13. (9/30) Give formal proofs that the following functions are not onto:

    (i) $f: \mathbb{R} - \{n\pi \mid n \in \mathbb{Z}\} \to \mathbb{R}$ defined by $f(x) = \csc(x)$.
    (ii) $f: \mathbb{R} \times \mathbb{R} \times \mathbb{R} \to \mathbb{R}$ defined by $f(x, y, z) = x^2 + y^2 + z^2$.

14. (10/10) Prove that the sine function $\sin: \mathbb{R} \to \mathbb{R}$ is not injective.

15. (10/10) Use Rolle's Theorem and proof by contradiction to prove that the sine function $\sin: [-\frac{\pi}{2}, \frac{\pi}{2}] \to \mathbb{R}$ is injective.

16. (10/10) 1.8 # 28, 29, 31