# MATH 211 – Answers to Review Problems

**30 Nov. 2007**

1. $54.7°$
2. 
3. $(\frac{2}{3}, -\frac{1}{3}, \frac{2}{3})$
4. 
5. $35.3°$
6. 
7. 
8. 
9. $\mathbf{r}(t) = (t, t^2, \frac{1}{2}t^2)$
10. $\mathbf{r}(t) = (3\cos t, \frac{3}{\sqrt{2}}\sin t, \frac{3}{\sqrt{2}}\cos t)$
11. a) $t = \pm 2$; $(x, y) = (4, 0)$ b) $53.13°$
12. $2x + y + 3z = 8$
13. $t = 8$; $(8, 28, -80)$
14. $\mathbf{r}(s) = (2, 0, 1) + s(2, 2, 1)$; $2x + 2y + z = 5$
15. $\mathbf{T} = (1, 0, 0)$ at $(0, 0, 0)$; $\mathbf{T} = \frac{1}{\sqrt{14}}(1, -2, 3)$ at $(-1, 1, -1)$; $\mathbf{T} = \frac{1}{\sqrt{161}}(1, 4, 12)$ at $(2, 4, 8)$
16. 
17. $4\sqrt{13}\pi$
18. 57
19. a) $\mathbf{T}(2) = \frac{1}{\sqrt{5}}(2, 1, 0)$; $\mathbf{N}(2) = \frac{1}{\sqrt{5}}(1, -2, 0)$
20. a) $\frac{1}{\sqrt{3}}(1, 1, 1)$ b) $\sqrt{3}(e - 1)$
21. 
22. b) hottest: $(4, -3)$ coldest: $(-4, 3)$ c) i) $(4, -3)$ ii) $(-4, 3)$ iii) $\pm(3, 4)$ d) $-9°\text{C/s}$ e) $0°\text{C/cm}$
23. b) $\pm(1, 2)$
24. b) i) $(1, 2)$ ii) $\pm(2, -1)$
25. b) $x + y = 4$
26. a) $9/\sqrt{5}$ b) $(1, 4)$; $\sqrt{17}$ c) $x + 4y - z = 3$
27. $-3/\sqrt{6}$
28. $\mathbf{r}(t) = (2, 1, 6) + t(1, \frac{1}{2}, 6)$
29. $3x + 2y + 6z = 49$
30. $2x + 4y + z = 14$

31. $6x + 3y - z = 11$; $\mathbf{r}(t) = (3, 1, 10) + t(6, 3, -1)$

32.

33. a) 2.02 b) 2

34. 143

35. a) 28°C/s b) $\frac{28}{\sqrt{17}}$°C/cm

36. $3x + 5y - 4z = 18$

37. $(4, 1, 2)$

38. a) $(2, 2, -2)$ b) $4/\sqrt{2} = 2\sqrt{2}$

39. $\mathbf{r}(t) = (\frac{3}{2}, \frac{1}{2}, 0) + t(0, 1, 1)$

40. a) 14°C/s b) $\sqrt{14}$°C/cm

41. local min at $(1, -2, -10)$; saddle at $(-1, -2, 2)$

42. local max at $(-1, -1, 12)$ and $(1, 1, 12)$; saddle at $(0, 0, 10)$

43. max=4, min=$-4$

44. max=$2\sqrt{37}$, min=$-2\sqrt{37}$

45. 72

46. $\frac{1134}{5}$

47. $\frac{1}{4}$

48. $(e^{3125} - 1)/10$

49. $\frac{\pi}{4}(1 - e^{-4})$

50. 195