1 Answers: MATH 251   Extra Practice (for Exam 1)

1. **(a)** $\langle 1, 1, -1 \rangle$; $\langle 3, -4, 5 \rangle$

   (b) $6/\sqrt{150}$

   (c) $x = 2 + t, y = -8t, z = -7t$

2. **(a)** $D = \{(x, y)|x^2 + y^2 \neq 1\}$ (the plane $\mathbb{R}^2$ without the unit circle centered at origin).

   (b) level lines are circles centered at $(0,0)$ with radius $\sqrt{\frac{k+1}{k-1}}$. It is sufficient to draw several level lines: f.ex. $k = 2$: $x^2 + y^2 = 3$; $k = 3, x^2 + y^2 = 2$.

3. (a) $1; -3$ (b) $\mathrm{d}x - 3\mathrm{d}y$ (c) -0.28

4. Hint: use Chain Rule.

5. **(a)** $2x + 6y - z = -6$

   (b) paraboloid (axis is parallel to z-axis, vertex at $(1, -3, 0)$)

6. $\dfrac{yze^{x+y} - z\cos(xyz)}{x\cos(xyz) - ye^{x+y}}$; $\dfrac{(2 + y)yze^{x+y} - xz\cos(xyz)}{xy\cos(xyz) - y^2 e^{x+y}}$

7. decreasing at rate $9600\pi cm^3/s$

8. $x = -2t, y = 1, z = \pi/2 + t$

9. b.

10. d.

11. (b) $6; 2$.   (c) $6x + 2y - z - 20 = 0$.

12. $5cm^2$

13. (a) $\langle 1, \sqrt{2}\cos t, -\sqrt{2}\sin t \rangle$.   (b) $x = \pi/4 + t, y = 1 + t, z = 1 - t$.