

Solutions to review problems for exam 1.

1. (a) $2\sqrt{2}$; (b) $\langle 1/\sqrt{2}, 0, 1/\sqrt{2} \rangle$; (c) 6; (e) $\pi/6$; (f) $\langle 4, 1, 3 \rangle$; (g) $3/\sqrt{2}$; (h) $\langle 3/2, 0, 3/2 \rangle$; (i) $\langle -2, 2, 2 \rangle$.

2. $x + y + z + 1 = 0$

3. (a) $(88, -27, -66)$; (b) $\arccos(1/14)$.

4. $\langle -1, 0, 3 + 3\pi \rangle$

5. $f_x = y\cos(xy + z)$; $f_y = x\cos(xy + z)$; $f_z = \cos(xy + z)$

6. \mathbf{r}_1

7. $4x - 8y + z = 1$

8. (a) $df(1, 1) = 2dx - dy$; (b) $f(1.1, 0.9) \approx f(1, 1) + (2)(0.1) + (-1)(-0.1) = 3.3$

9. $f(x, y, z) = x^2 + y^2 - \cos(xy) - z$, $g(x, y) = x^2 + y^2 - \cos(xy)$

10. $\frac{dz}{dt} = (\sin(2te^{t^2}) + 2te^{t^2}\cos(2te^{t^2}))(2te^{t^2}) + (e^{2t^2}\cos(2te^{t^2}))(2)$

11. $f(2, 3, 4) = 40$ and the differential of f at $(2, 3, 4)$ is $df = 60dx + \frac{24}{5}dy + \frac{32}{5}dz$. Taking $dx = -0.02$, $dy = 0.01$, and $dz = -0.03$, we obtain: $f(1.98, 3.01, 3.97) \approx 40 - 1.344 = 38.656$.