

Project 2 - Phase 3
priyananda (shenoy@cs.wisc.edu)

1.

X axis points at $(-1, 0, 0)$

$$\begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & \frac{-1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

2.

X axis goes to $(-1, 0, 0)$

Y axis goes to $(0, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$

Z axis goes to $(0, -\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

Matrix form is:

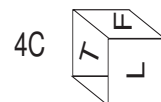
$$\begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 \\ 0 & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

The inverse matrix is:

$$\begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 \\ 0 & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

3. $(\frac{5}{16}, -\frac{3}{16})$

4.



5.

$$\begin{aligned}
 f(u) &= (0, 6u) \text{ if } u \leq \frac{1}{6} \\
 &= (6(u - \frac{1}{6}), 1) \text{ if } \frac{1}{6} \geq u \leq \frac{4}{6} \\
 &= (3, 6(u - \frac{4}{6}) + 1) \text{ otherwise}
 \end{aligned}$$

$$\begin{aligned}
 6. \quad f(\frac{1}{2}) &= (2, \frac{35}{16}) \\
 f'(\frac{1}{2}) &= (5, \frac{-1}{8}) \\
 |f'| &= \sqrt{\frac{1601}{8}}
 \end{aligned}$$

$$7. \quad (4, 0), (4, \frac{-8}{3}), (0, -\frac{8}{3}), (0, 0)$$

8.

First Part: $(0, 0), (0, 1), (\frac{1}{2}, 2), (\frac{5}{4}, \frac{5}{2}), (2, \frac{5}{2})$
 Second Part: $(2, \frac{5}{2}), (\frac{11}{4}, \frac{5}{2}), (\frac{7}{2}, 2), (4, 1), (4, 0)$