

Homework 1

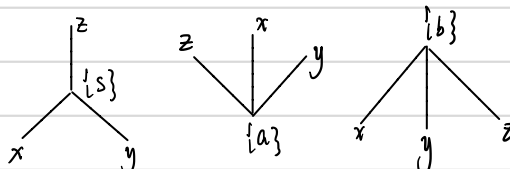
2.1, $\mathbb{R}^n \times S^{n-1} \times S^{n-2} \times \dots \times S^1$

2.4. $2n-1$

2.9 (a) 3 (b) 3

2.22 (a) 21, 20, 19, 18 (b) 25, 24, 23, 22 (c) 10 (d) 18

2.29 (a) $\mathbb{R}^2 \times S^1$ (b) $S^2 \times S^1$ (c) $\mathbb{R}^2 \times T^4 \times [a, b]$ (d) $\mathbb{R}^3 \times S^2 \times T^7$

3.1 (a) 

(b) $R_{sa} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & -1 \\ 1 & 0 & 0 \end{bmatrix}$, $R_{sb} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & -1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{bmatrix}$

(d) $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix}$

(e) $R_1 = \begin{bmatrix} 0 & 0 & -1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, corresponds to a rotation about body-fixed \hat{x}_a -axis

$R_2 = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, corresponds to a rotation about world-fixed \hat{x}_b -axis

(f) $[1, 3, -2]^T$

(g) $p' = \begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix}$, interpreted as moving the point

$p'' = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}$, interpreted as changing coordinates

(h) $[1, -3, -2]^T$

(i) $[\hat{w}] = \frac{\sqrt{3}}{3} \begin{bmatrix} 0 & -1 & -1 \\ 1 & 0 & -1 \\ 1 & 1 & 0 \end{bmatrix}$, $\hat{w} = \frac{\sqrt{3}}{3} \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$, $\theta = \frac{2}{3}\pi$

(j) $R = \begin{bmatrix} -0.2938 & 0.6469 & 0.7037 \\ 0.6469 & 0.6765 & -0.3518 \\ -0.7037 & 0.3518 & -0.6173 \end{bmatrix}$

