```
Quit[];
```

In[380]:=

(* Problem 2i*)

```
(* See equation(3.88)*)
```

$$M = \begin{pmatrix} 0 & 0 & 1 & 3 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$

$$Minv = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -2 \\ 1 & 0 & 0 & -3 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$

(* Problem 2ii*)

```
(* See equation (3.148)*)
```

$$VsSkew = \begin{pmatrix} 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix};$$

(* Problem 2iii*)

```
(* See eq (3.155) *)
```

$$Vb = \begin{pmatrix} 0 \\ 1 \\ 0 \\ 3 \\ 0 \\ 0 \end{pmatrix};$$

(* Problem 2iv*)

```
(*See EQ (3.109)*)
```

$$expVS = \begin{pmatrix} Cos[1] & -Sin[1] & 0 & 0 \\ Sin[1] & Cos[1] & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$

$$expVS = \begin{pmatrix} 0.5403 & -0.8415 & 0 & 0 \\ 0.8415 & 0.5403 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$

(* Problem 2v*)

```
(* For this problem you were asked to take the matrix
  logarithm of the M matrix. The algorithm is on page 72.
```

There are a number of ways to represent the solution. The first is a 4x4 matrix [S] and θ. The second is a 4x4 matrix [V]. The third ia a 6x1 S=[ω,v] vector and θ. The fourth is the 6x1 exponential coordinate vector V=Sθ. These were all acceptable solutions.

Dividing S=[ω,v]/θ is incorrect, and only multiplying part of the S vector by θ is also incorrect. If your v values are correct but in the wrong order, check to make sure you are using the updated version of eq (3.116) in the notes*)

(* 4x4 matrix [S] and θ*)

$$\text{Sskew} = \begin{pmatrix} 0 & -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 0.6033 \\ \frac{1}{\sqrt{3}} & 0 & -\frac{1}{\sqrt{3}} & 0.026 \\ -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & 0 & 1.758 \\ 0 & 0 & 0 & 0 \end{pmatrix}; \ \theta == 2 * \pi / 3;$$

(* 4x4 matrix [V] or [Sθ] *)

$$\text{Vskew} = \begin{pmatrix} 0. & -1.2092 & 1.2092 & 1.2635 \\ 1.2092 & 0. & -1.2092 & 0.0544 \\ -1.2092 & 1.2092 & 0. & 3.6819 \\ 0. & 0. & 0. & 0 \end{pmatrix};$$

(*6x1 S=[ω,v] vector and θ*)

$$S = \begin{pmatrix} 1/\sqrt{3} \\ 1/\sqrt{3} \\ 1/\sqrt{3} \\ 0.6033 \\ 0.0260 \\ 1.7580 \end{pmatrix}; \ \theta == 2 * \pi / 3;$$

$$S = \begin{pmatrix} 0.5774 \\ 0.5774 \\ 0.5774 \\ 0.6033 \\ 0.0260 \\ 1.7580 \end{pmatrix}; \ \theta = 2.0944;$$

(*6x1 exponential coordinate vector V=Sθ*)

$$V = \begin{pmatrix} 1.2092 \\ 1.2092 \\ 1.2092 \\ 1.2635 \\ 0.0544 \\ 3.6819 \end{pmatrix};$$

(* Problem 2vi*)

```
(*Transformation from space to body frame
 using space screw representations. Should be able to
 draw out the configuration and confirm your answer*)
```

$$S1 = \begin{pmatrix} 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}; S2 = \begin{pmatrix} 0 \\ 1 \\ 0 \\ -2 \\ 0 \\ 0 \end{pmatrix}; S3 = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{pmatrix};$$

$$TsbSpace = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & -2 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$

(* Problem 2vii*)

```
(*Transformation from space to body frame
 using body screw representations. Should be able to
 draw out the configuration and confirm your answer*)
```

$$B1 = \begin{pmatrix} 0 \\ 1 \\ 0 \\ 3 \\ 0 \\ 0 \end{pmatrix}; B2 = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \\ -3 \\ 0 \end{pmatrix}; B3 = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \end{pmatrix};$$

$$TsbBody = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & -2 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$