

Exercise 1.1: Describe all vectors $\mathbf{w} = (w_1, w_2)$ that are perpendicular to $\mathbf{v} = (2, -1)$.

Solution:

The vectors are perpendicular if $\mathbf{v} \cdot \mathbf{w} = 0$. That is, we require

$$2w_1 - w_2 = 0$$

or equivalently, $w_2 = 2w_1$. Hence

$$\mathbf{w} = \begin{bmatrix} a \\ 2a \end{bmatrix}$$

where a is a real number.

Exercise 1.2: Use Octave to plot $\sin(x)$ and $\cos(x)$ for $-\pi \leq x \leq \pi$ on the same graph. Make sure the graph is labeled nicely.

Solution:

```
octave:1> x=[-pi:0.01:pi];  
octave:2> plot(x,sin(x),x,cos(x));  
octave:3> set(gca, "fontsize", 14 )  
octave:4> xlabel("x");ylabel("y");title("sin and cos");  
octave:5> legend("sin", "cos");
```

