Norms

Once we build a vector of errors we need some way of quantifying how large this is. There are 3 convenient norms we can use:

1. The maximum or infinity norm is the largest – in absolute value – element of the vector. For example, I can define a 20 long vector of random elements and take its maximum norm:

```
>> error=rand(1,20);
>> norm(error,inf)

ans =

    0.9688
```

2. The 1-norm is the sum of absolute values

$$\|e\|_1 = \sum_{j=1}^{n} |e_j|$$

```
>> norm(error,1)

ans =

    11.0589
```

but to compare vectors of different sizes it makes more sense to average these by dividing by the size of it

$$\|e\|_1 = \frac{1}{n} \sum_{j=1}^{n} |e_j|$$

```
>> norm(error,1)/20

ans =

    0.5529
```

3. The 2-norm is the squareroot of the sum of squares,

$$\|e\|_2 = \sqrt{\sum_{j=1}^{n} e_j^2}$$

```
>> norm(error,2)

ans =

    2.8368
```

but again it is better to divide by the square-root of the size of the vector

$$\|e\|_2 = \frac{1}{\sqrt{n}} \sqrt{\sum_{j=1}^{n} e_j^2}$$

```
>> norm(error,2)/sqrt(20)

ans =

    0.6343
```