Plotting Error Bands

(This is probably beyond the scope of this course, but it's really cool and useful!)

Question: How do the uncertainties in the fit parameters translate into uncertainties in the fit itself?

Answer: it's really complicated!!

It's a ton of math statistics theory involved here ....

a miracle occurs.

ps = np.random.multivariate_normal(... 10000)

(.popt, pcov,

→ This will create a "sample" of 10000 choices of the fit parameters, with each fit parameter chosen using a Gaussian distribution around the central value (popt) according to the covariance matrix (pcov).

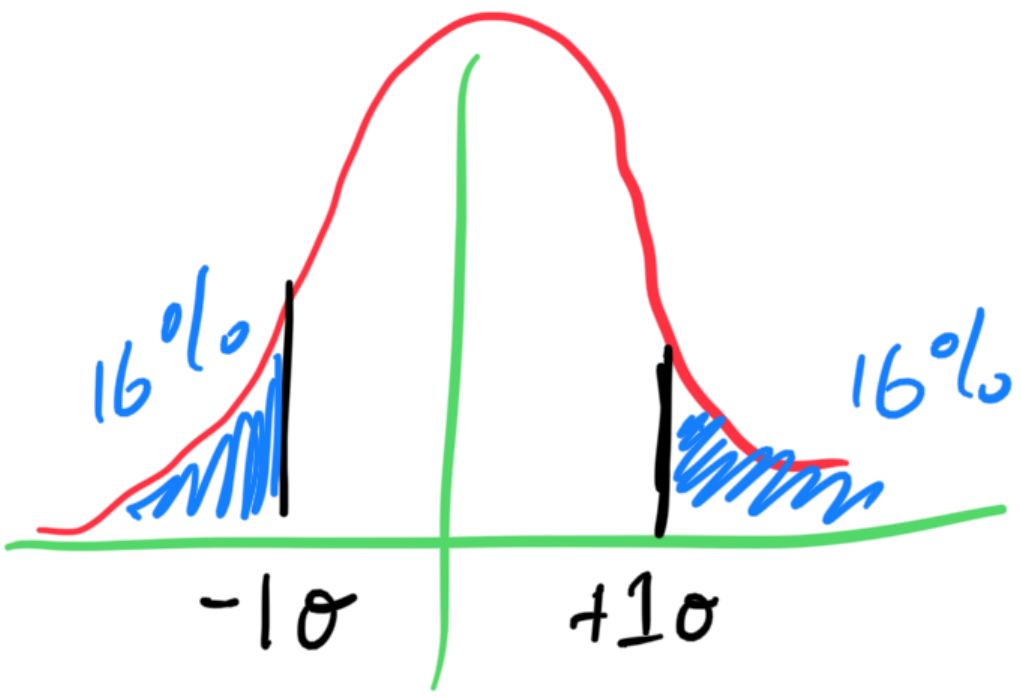
```
ysample = np.asarray(
    [fitfunction(xfit, *pi) for pi in ps])
```

→ This will create 10000 fit lines, based on the 10000 samples of the fit parameters.

```
upper = np.percentile(ysample, 84.0, axis=0)
```

→ This will create an "upper"

→ This ... band limit → 84th percentile, which corresponds to +1σ



central value

lower = np.percentile(y_sample, 16.0, axis=0)