ENGR101
TUTORIAL 8

CORE 1

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-\left(\frac{x}{?}\right)^2}{2}}$$

$= 0.053990966 51$

$= 0.05$

CORE 2

Because there is no possible way the probability can add to 1 when you are adding the probability of an infinite set of finite numbers.

CORE 3

Since the probability of getting the +ve value and the -ve value is the same, over time the probability will therefore become ≈ zero. The amplitude of the noise is at approx 0.14, the red graph.

COMPLETION 1

If you keep averaging over time the noise will average to zero and the signal would average to about the signal.

COMPLETION 2

N_{TRIALS}	Avg mag of noise
1	0.8
10	0.25
100	0.082
1000	0.026
10,000	0.00079
100,000	0.0026

If you averge n samples of the noise, the magnitude decrease by $\sqrt{n}$.
The $\pm$ for a mag decreases by $\sqrt{n}$ for n measurement

COMPLETION 3

- Specification — How accurately do you need to measure the voltage?
  - How long can you afford to take to average the data?
    → Can't take so long that the signal changes significantly during measurement.

- Specs suggest a simple rate, but what is your budget?

- Can you change the measurement or hardware to reduce noise before averaging.

FOR AVC:
- Avoid wiggling camera
- Better light conditions
- Bigger camera.
- Tradeoff between image res add frame rate

CHALLENGE

$$\overline{|x|} = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} |x| e^{-\frac{x^2}{2}} dx$$

$\cancel{d}u = x^2$

$du = 2x\,dx$

$$= \frac{2}{\sqrt{2\pi}} \int_{-\cancel{\infty}}^{\infty} e^{\frac{-x^2}{2}} x\,dx \quad \frac{du}{2}$$

$$e^{-\frac{u}{2}} \frac{du}{2}$$

$$\rightarrow \frac{1}{\cancel{2}\sqrt{2\pi}} \int_0^{\infty} e^{-\frac{u}{2}} du$$

$$= \left[\frac{1}{\sqrt{2\pi}} \frac{e^{-\frac{u}{2}}}{-\frac{1}{2}} \right]_0^{\infty}$$