Quiz 1
## Time: 15 minutes

Problem 1

Consider the following communication problem:

There are two equiprobable hypotheses. When $H = 0$, we transmit $s = -b$, where b is an arbitrary but fixed positive number. When $H = 1$, we transmit $s = b$.

The channel is as shown in the figure below, where $Z \sim \mathcal{N}(0, \sigma^2)$ represents the noise, $A \in \{0, 1\}$ represents a random attenuation (fading) with $P_A(0) = \frac{1}{2}$, and Y is the channel output. The random variables H, A and Z are independent.
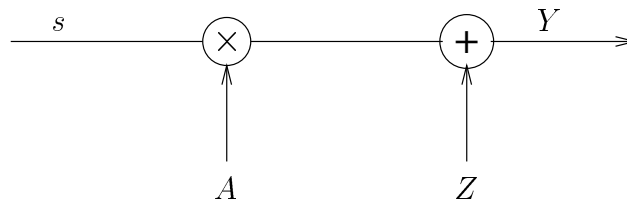
(i) Find the decision rule that the receiver should implement to minimize the probability of error. Sketch the decision regions.

(ii) Calculate the probability of error $Pr\{e\}$, based on the above decision rule.