STA 5364, Report 1

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Report 1.1

To establish the "Properties of survival curves" theorem, we first establish a continuous, non-negative random variable X with cumulative distribution function F. Per KM (2.2.1), the survival function is $P(X > x)$, which is equivalently written as $S(x) = 1 - P(X \leq x) = 1 - F(x)$. Since cumulative distribution functions are real-valued, nondecreasing, and right-continuous, and their range is bounded between 0 and 1, we have that $S(x)$ is also then real-valued, non-negative ($\sup F(x) = 1 \implies S(x) \geq 0$), monotonic, and nonincreasing. We also have then that since $X \geq 0$, $F(0) = 0$, which implies $S(0) = 1$. Since $\lim_{x \to \infty} F(x) = 1$, we finally also have that as $\lim_{x \to \infty} S(x) = 1 - 1 = 0$.