PAGE 164
If $A = A_1 \times A_2$, then the function $\omega_2 \mapsto P(A_{\omega_2})$ is a step function:

$$P(A_{\omega_2}) = \begin{cases} P(A_1) & \text{if } \omega_2 \in A_2 \\ 0 & \text{if } \omega_2 \notin A_2 \end{cases}$$

and hence we have

$$P(A) = P_1(A_1)P_2(A_2) = \int_{\Omega_2} P(A_{\omega_2})\,\mathrm{d}P_2(\omega_2).$$

replaced by
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$$P(A) = P_1(A_1)P_2(A_2) = \int_{\Omega_2} P_1(A_{\omega_2})\,\mathrm{d}P_2(\omega_2).$$

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(6.3)

$$\int_{\Omega_1} P_1(A_{\omega_2})\,\mathrm{d}P_2(\omega_2) = \int_{\Omega_2} P_2(A_{\omega_1})\,\mathrm{d}P_1(\omega_1). \tag{1}$$

replaced by

$$\int_{\Omega_2} P_1(A_{\omega_2})\,\mathrm{d}P_2(\omega_2) = \int_{\Omega_1} P_2(A_{\omega_1})\,\mathrm{d}P_1(\omega_1). \tag{2}$$

65, Theorem 3.12

Theorem 0.1

If $f : E \to \mathbb{R}$ is measurable, $E \in \mathcal{M}$, $g : E \to \mathbb{R}$ is such that the set $\{x : f(x) = g(x)\}$ is null, then g is measurable.

replaced by

Theorem 0.2

If $f : E \to \mathbb{R}$ is measurable, $E \in \mathcal{M}$, $g : E \to \mathbb{R}$ is such that the set $\{x : f(x) \neq g(x)\}$ is null, then g is measurable.

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But the (E_n) are disjoint: to see this, suppose that $z \in E_m \cap E_n$ for some $m \neq m$.

replaced by

But the (E_n) are disjoint: to see this, suppose that $z \in E_m \cap E_n$ for some $m \neq n$.

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Proposition 0.3

The completion of $\mathcal{G}$ is of the form $\{G \cup N : G \in \mathcal{F}, N \subset F \in \mathcal{F} \text{ with } \mu(F) = 0\}$.

replaced by

Proposition 0.4

The completion of $\mathcal{G}$ is of the form $\{G \cup N : G \in \mathcal{G}, N \subset F \in \mathcal{F} \text{ with } \mu(F) = 0\}$.

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Fix $m < n$ and define a σ-field $\mathcal{F}_m = \{A : \omega, \omega' \in A \Longrightarrow \omega_1 = \omega'_1, \omega_2 = \omega'_2, \ldots, \omega_m = \omega'_m\}$. So all paths from a particular set A in this σ-field have identical initial segments while the remaining coordinates are arbitrary. Note that

replaced by

Fix $m < N$ $\mathcal{F}_m$ to be the σ-field generated by the following family of sets $\{A : \omega, \omega' \in A \Longrightarrow \omega_1 = \omega'_1, \omega_2 = \omega'_2, \ldots, \omega_m = \omega'_m\}$. So all paths from a particular set A in this σ-field have identical initial segments while the remaining coordinates are arbitrary. Note that

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$$f^{-1}(I) = \{x \in \mathbb{R} : f(x) \in I\} \in \mathcal{M}.$$

replaced by

$$f^{-1}(I) = \{x \in E : f(x) \in I\} \in \mathcal{M}.$$

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$$X^{-1}(\mathcal{B}) = \{S \subset \mathcal{F} : S = X^{-1}(B) \text{ for some } B \in \mathcal{B}\}$$

replaced by

$$X^{-1}(\mathcal{B}) = \{S \in \mathcal{F} : S = X^{-1}(B) \text{ for some } B \in \mathcal{B}\}$$

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The simplest possible case is where X is constant, $X \equiv a$. The $X^{-1}(B)$ is either Ω or $\emptyset$, depending on whether $a \in B$ or not and the σ-field generated is trivial: $\mathcal{F} = \{\emptyset, \Omega\}$.

The simplest possible case is where X is constant, $X \equiv a$. The $X^{-1}(B)$ is either Ω or $\emptyset$, depending on whether $a \in B$ or not and the σ-field generated is trivial: $\mathcal{F}_X = \{\emptyset, \Omega\}$.

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Exercise 0.1

Find the integral of φ over E where

(a) $\varphi(x) = \mathrm{Int}(x)$, $E = [0, 10]$,

(b) $\varphi(x) = \mathrm{Int}(x^2)$, $E = [0, 2]$,

(c) $\varphi(x) = \mathrm{Int}(\sin x)$, $E = [0, 2\pi]$

and Int denotes the integer part of a real number. (Note that many texts use the symbol $[x]$ to denote $\mathrm{Int}(x)$. We prefer to use Int for increased clarity.)

replaced by

Exercise 0.2

Find the integral of φ over E where

(a) $\varphi(x) = \mathrm{Int}(x)$, $E = [0, 10]$,

(b) $\varphi(x) = \mathrm{Int}(x^2)$, $E = [0, 2]$,

(c) $\varphi(x) = \mathrm{Round}(\sin x)$, $E = [0, 2\pi]$

where $\mathrm{Int}(x)$ denotes the integer part of x and $\mathrm{Round}(x)$ is the integer nearest to x, $\mathrm{Round}(0.5)$ being zero. (Note that many texts use the symbol $[x]$ to denote $\mathrm{Int}(x)$. We prefer to use Int for increased clarity.)

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Step 4. Finally, let f, g be arbitrary integrable functions. Since

$$\int_E |f + g| \,\mathrm{d}m \leq \int_E (|f| + |g|) \,\mathrm{d}m,$$

we can use Step 2 to deduce that the left-hand side is finite.

replaced by

Step 4. Finally, let f, g be arbitrary integrable functions. Since

$$\int_E |f+g| \, \mathrm{d}m \leq \int_E (|f| + |g|) \, \mathrm{d}m,$$

we can use Step 3 to deduce that the left-hand side is finite.