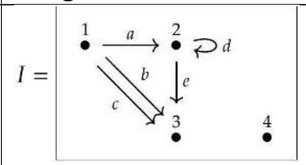
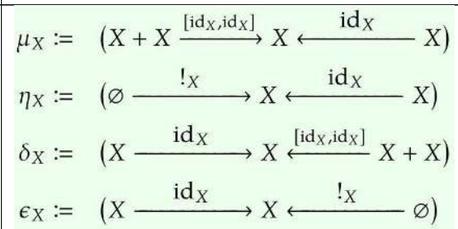
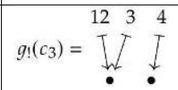
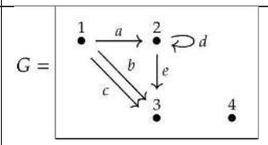
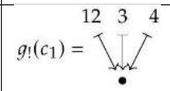
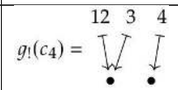
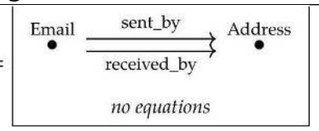
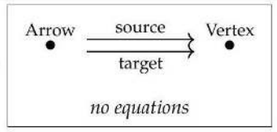
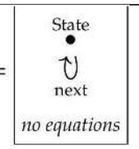
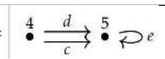
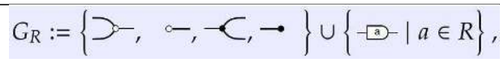
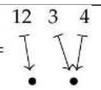
fong-spivak-seven-sketches: equation evidence

Display equations

Identifier	Page	Conf.	LaTeX source	Rendered	Image
fong-spivak-seven-sketches EQ0061 (3.61) **[conf 0.008]**	110	■ 0.008	I=\left[\begin{array}{ccc} 1 & \underset{\bullet}{a} & \stackrel{2}{\bullet}{ }^{b} d \\ & \downarrow & \\ & \downarrow & \\ & \downarrow & \bullet \end{array}\right.	$I = \left[\begin{array}{ccc} 1 & \underset{\bullet}{a} & \stackrel{2}{\bullet}{}^{b} d \\ & \downarrow & \\ & \downarrow & \\ & \downarrow & \bullet \end{array}\right.$	
fong-spivak-seven-sketches EQ0063 **[conf 0.014]**	111	■ 0.014	G:=\stackrel{1}{\bullet} \stackrel{a}{\longrightarrow} \stackrel{b}{\longrightarrow} \stackrel{3}{\bullet} \quad H:=\stackrel{4}{\leftrightarrow} \xrightarrow[c]{d} \bullet \stackrel{5}{\hookrightarrow} \text { Pe }	$G := \stackrel{1}{\bullet} \xrightarrow{a} \xrightarrow{b} \stackrel{3}{\bullet} \quad H := \stackrel{4}{\leftrightarrow} \xrightarrow[c]{d} \bullet \stackrel{5}{\hookrightarrow} \text{ Pe }$	
fong-spivak-seven-sketches EQ0133 **[conf 0.025]**	214	■ 0.025	\begin{aligned} \mu_{X} & :=\left(X+X \xrightarrow{\left[\mathrm{id}_{X}, \mathrm{id}_{X}\right]} X \longleftrightarrow^{i d}_{X} X\right) \\ \eta_{X} & :=\left(\varnothing \xrightarrow{!_{X}} X \stackrel{\mathrm{id}_{X}}{\longleftrightarrow} X\right) \\ \delta_{X} & := \left(X \xrightarrow{\mathrm{id}_{X}} X \stackrel{\left[\mathrm{id}_{X}, \mathrm{id}_{X}\right]}{-} X+X\right) \\ \epsilon_{X} & :=\left(X \xrightarrow{\mathrm{id}_{X}} X \longleftrightarrow!_{X}\varnothing\right) \end{aligned}	$\begin{aligned} \mu_{X} & :=\left(X+X \xrightarrow{\left[\mathrm{id}_{X}, \mathrm{id}_{X}\right]} X \longleftrightarrow^{i d}_{X} X\right) \\ \eta_{X} & :=\left(\varnothing \xrightarrow{!_{X}} X \stackrel{\mathrm{id}_{X}}{\longleftrightarrow} X\right) \\ \delta_{X} & := \left(X \xrightarrow{\mathrm{id}_{X}} X \stackrel{\left[\mathrm{id}_{X}, \mathrm{id}_{X}\right]}{-} X+X\right) \\ \epsilon_{X} & :=\left(X \xrightarrow{\mathrm{id}_{X}} X \longleftrightarrow!_{X}\varnothing\right) \end{aligned}$	
fong-spivak-seven-sketches EQ0188 **[conf 0.038]**	279	■ 0.038	g_{!}\left(c_{3}\right)={ }^{12}{ }_{\downarrow}{ }^{3} \stackrel{4}{\bullet}	$g_{!}\left(c_{3}\right)={ }^{12}{}_{\downarrow}{}^{3} \stackrel{4}{\bullet}$	
fong-spivak-seven-sketches EQ0181 **[conf 0.044]**	274	■ 0.044	G=\left|\begin{array}{ccc} 1 & \underset{\bullet}{a} & \stackrel{2}{\bullet} \\ & \downarrow & \downarrow \\ & \downarrow & \\ & \downarrow & \end{array}\right|	$G = \left\|\begin{array}{ccc} 1 & \underset{\bullet}{a} & \stackrel{2}{\bullet} \\ & \downarrow & \downarrow \\ & \downarrow & \\ & \downarrow & \end{array}\right\|$	
fong-spivak-seven-sketches EQ0186 **[conf 0.050]**	279	■ 0.050	g!\left(c_{1}\right)={ }^{12} 3{ }^{4}	$g!\left(c_{1}\right)={ }^{12} 3^{4}$	
fong-spivak-seven-sketches EQ0189	279	■ 0.108	g_{!}\left(c_{4}\right)=\amalg_{\bullet}^{12} I^{3} \stackrel{4}{\downarrow}	$g_{!}\left(c_{4}\right)=\amalg_{\bullet}^{12} I^{3} \stackrel{4}{\downarrow}$	

Identifier	Page	Conf.	LaTeX source	Rendered	Image
fong-spivak-seven-sketches EQ0073 (3.77)	118	0.114	`\mathcal{G}:=\left|\stackrel{\text { Email }}{\underset{\text { received_by }}{\stackrel{\text { sent_by }}{\rightleftharpoons}}}{ }^{\text {Address }} \bullet \right|`	*(not rendered)*	$\mathcal{G} :=$ 
fong-spivak-seven-sketches EQ0245	311	0.129	`a_{m}:=(1+\cdots+1+\cdots) ; \cdots ;(1+1+\supset-) ;(1+\cdots) ; \cdots: m \rightarrow 1`	$a_m := (1+\cdots+1+\cdots);\cdots;(1+1+\supset-);(1+\cdots);\cdots : m \to 1$	$a_m := (1+\cdots+1+\succ)\fatsemi\cdots\fatsemi(1+1+\succ)\fatsemi(1+\succ)\fatsemi\succ : m \to 1$
fong-spivak-seven-sketches EQ0083	136	0.147	`\text { Chassis: }(\text { load × velocity }) \rightarrow \text { (torque } \text { × speed } \times \$ \text { ) }`	Chassis: (load × velocity) → (torque × speed × $)	Chassis: $(\text{load} \times \text{velocity}) \rightarrowtail (\text{torque} \times \text{speed} \times \$)$
fong-spivak-seven-sketches EQ0205	290	0.147	`A, \quad A \div f, \quad A \div g, \quad A \div f \div h, \quad A \div g \text { i } i, \quad B, \quad B \doteqdot h, \quad C, \quad C: i, \quad D`	$A,\quad A \div f,\quad A \div g,\quad A \div f \div h,\quad A \div g \text{ i } i,\quad B,\quad B \doteqdot h,\quad C,\quad C : i,\quad D$	$A,\quad A \fatsemi f,\quad A \fatsemi g,\quad A \fatsemi f \fatsemi h,\quad A \fatsemi g \fatsemi i,\quad B,\quad B \fatsemi h,\quad C,\quad C \fatsemi i,\quad D$
fong-spivak-seven-sketches EQ0064 (3.65)	112	0.147	`\mathbf{G r}:=\stackrel{\text { Arrow }}{}{\rightarrow} \underset{\text { target }}{\stackrel{\text { source }}{\rightrightarrows}} \stackrel{\text { Vertex }}{\text { no equations }}`	$\mathbf{Gr} := \overset{\text{Arrow}}{\to} \underset{\text{target}}{\overset{\text{source}}{\rightrightarrows}} \overset{\text{Vertex}}{\text{no equations}}$	$\mathbf{Gr} :=$  $\mathbf{DDS} :=$ 
fong-spivak-seven-sketches EQ0214	294	0.168	`H:=\stackrel{4}{\longrightarrow} \underset{c}{\stackrel{d}{\longrightarrow}} \stackrel{5}{\bullet} \gtrdot e`	$H := \overset{4}{\longrightarrow} \underset{c}{\overset{d}{\longrightarrow}} \overset{5}{\bullet} \gtrdot e$	$H :=$ 
fong-spivak-seven-sketches EQ0115	182	0.203	`G_{R}:=\{\supset-, \circ-, \subset, \longrightarrow\} \cup\{-\mathrm{a}-\mid a \in R\},`	$G_R := \{\supset -, \circ -, \subset, \longrightarrow\} \cup \{-\mathrm{a}- \mid a \in R\},$	$G_R :=$ 
fong-spivak-seven-sketches EQ0187	279	0.215	`g_{!}\left(c_{2}\right)=\Psi_{\bullet}^{12} \mathrm{~J}^{3} 4^{4}`	$g_!\left(c_2\right) = \Psi_{\bullet}^{12} \mathrm{~J}^{3} 4^{4}$	$g_!(c_2) =$ 
fong-spivak-seven-sketches EQ0094	148	0.259	`\begin{array}{ll} & S \times(T \times U):=\{(s,(t, u)) \mid s \in S, t \in T, u \in U\} \\ =? & (S \times T) \times U:=\{((s, t), u) \mid s \in S, t \in T, u \in U\} . \end{array}`	$\begin{array}{ll} & S \times (T \times U) := \{(s,(t,u)) \mid s \in S, t \in T, u \in U\} \\ =? & (S \times T) \times U := \{((s,t),u) \mid s \in S, t \in T, u \in U\}. \end{array}$	$\begin{array}{ll} & S \times (T \times U) := \{(s,(t,u)) \mid s \in S, t \in T, u \in U\} \\ =? & (S \times T) \times U := \{((s,t),u) \mid s \in S, t \in T, u \in U\}. \end{array}$
fong-spivak-seven-sketches EQ0072	118	0.263	`\Sigma_{!}: \mathcal{C - I n s t} \rightarrow \text { Set } \quad \text { and } \quad \Pi_{!}: \mathcal{C}-\text { Inst } \rightarrow \text{ Set. }`	$\Sigma_! : \mathcal{C} - \mathcal{I}\backslash\int\sqcup \to \text{ Set} \quad \text{ and } \quad \Pi_! : \mathcal{C} - \text{ Inst} \to \text{Set.}$	$\Sigma_!$: $\mathcal{C}$-**Inst** → **Set** and $\Pi_!$: $\mathcal{C}$-**Inst** → **Set**.
fong-spivak-seven-sketches EQ0020 (2.10)	55	0.266	`\begin{array}{ll} h_{1}:=\{2 \diamond, 3 \diamond, 10 \bullet, J \bullet, Q \bullet\} & i_{1}:=\{4 \diamond, 4 \diamond, 6 \diamond, 6 \diamond, 10 \diamond\} \\ h_{2}:=\{2 \diamond, 3 \diamond, 4 \diamond, K \star, A \diamond\} & i_{2}:=\{5 \diamond, 5 \diamond, 7 \diamond, J \diamond, Q \diamond\} . \end{array}`	$\begin{array}{ll} h_1 := \{2\diamond, 3\diamond, 10\bullet, J\bullet, Q\bullet\} & i_1 := \{4\diamond, 4\diamond, 6\diamond, 6\diamond, 10\diamond\} \\ h_2 := \{2\diamond, 3\diamond, 4\diamond, K\star, A\diamond\} & i_2 := \{5\diamond, 5\diamond, 7\diamond, J\diamond, Q\diamond\}. \end{array}$	$\begin{array}{ll} h_1 := \{2\heartsuit,\ 3\heartsuit,\ 10\spadesuit,\ \mathrm{J}\spadesuit,\ \mathrm{Q}\spadesuit\} & i_1 := \{4\clubsuit,\ 4\spadesuit,\ 6\heartsuit,\ 6\diamond,\ 10\diamond\} \\ h_2 := \{2\diamond,\ 3\diamond,\ 4\diamond,\ \mathrm{K}\spadesuit,\ \mathrm{A}\spadesuit\} & i_2 := \{5\spadesuit,\ 5\heartsuit,\ 7\heartsuit,\ J\diamond,\ Q\diamond\}. \end{array}$
fong-spivak-seven-sketches EQ0033	73	0.268	`X:=\operatorname{Ob}(\mathfrak{X}) \quad d(x, y):= \mathfrak{X}(x, y) .`	$X := \operatorname{Ob}(\mathfrak{X}) \quad d(x,y) := \mathfrak{X}(x,y).$	$X := \operatorname{Ob}(\mathfrak{X}) \quad d(x,y) := \mathfrak{X}(x,y).$

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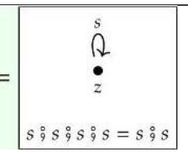
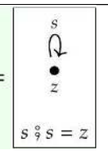
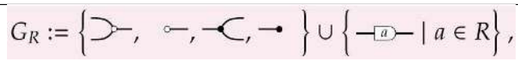
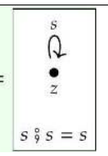
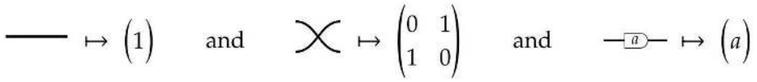
fong-spivak-seven-sketches EQ0175 (7.82)	268	0.278	`\begin{aligned} & \forall(t: \mathbb{R}) \cdot @_{t} \left(\operatorname{bad} _ \text {pos }(D)\right) \Rightarrow \\ & \quad \exists(r: \mathbb{R}) \cdot(0<r<1) \wedge \forall\left(r^{\prime}: \mathbb{R} \right) \cdot 0 \leq r^{\prime} \leq 5 \Rightarrow @_{t+r+r^{\prime}}(\operatorname{engaged}(T)) . \end{aligned}`	$\forall(t:\mathbb{R})\cdot @_t(\text{bad_pos}\ (D)) \Rightarrow$ $\exists(r:\mathbb{R})\cdot(0<r<1)\wedge\forall(r':\mathbb{R})\cdot 0\leq r'\leq 5 \Rightarrow @_{t+r+r'}(\text{engaged}(T)).$	$\forall(t:\mathbb{R}).@_t\big(\text{bad_pos}(D)\big) \Rightarrow$ $\exists(r:\mathbb{R}).(0<r<1)\wedge\forall(r':\mathbb{R}).0\leq r'\leq 5 \Rightarrow @_{t+r+r'}\big(\text{engaged}(T)\big).$
fong-spivak-seven-sketches EQ0057	97	0.293	`\mathcal{D}:=\left[\begin{array}{c} s \\ \hat{L} \\ \underset{z}{b} \\ s i s j s \text { is } s=s \text { is } \end{array}\right]`	$\mathcal{D} := \left[\begin{array}{c} s \\ \hat{L} \\ \underset{z}{b} \\ sisjs \text{ is } s=s \text{ is} \end{array}\right]$	$\mathcal{D} :=$ 
fong-spivak-seven-sketches EQ0184	274	0.304	`\begin{array}{rlrl} (\bullet)(\circ)(*) & \leq(\bullet)(\circ)(*) & (\bullet)(\circ)(*) & \leq(\bullet\circ)(*) \\ (\bullet)(\circ)(*) & \leq(\bullet)(\circ*) & (\bullet)(\circ)(*) & \leq(\bullet\circ*) \\ (\bullet\circ)(*) & \leq(\bullet\circ*) & (\bullet*)(\circ) & \leq(\bullet*)(\circ) \\ (\bullet)(\circ*) & \leq(\bullet)(\circ*) & (\bullet)(\circ*) & \leq(\bullet\circ*) \\ (\bullet\circ)(*) & & & \leq(\bullet\circ)(*) \\ (\bullet*)(\circ) & \leq(\bullet\circ*) & & \\ (\bullet\circ*) & \leq(\bullet\circ*) & & \end{array}`	$\begin{array}{rlrl} (\bullet)(\circ)(*) & \leq(\bullet)(\circ)(*) & (\bullet)(\circ)(*) & \leq(\bullet\circ)(*) \\ (\bullet)(\circ)(*) & \leq(\bullet)(\circ*) & (\bullet)(\circ)(*) & \leq(\bullet\circ*) \\ (\bullet\circ)(*) & \leq(\bullet\circ*) & (\bullet*)(\circ) & \leq(\bullet*)(\circ) \\ (\bullet)(\circ*) & \leq(\bullet)(\circ*) & (\bullet)(\circ*) & \leq(\bullet\circ*) \\ (\bullet\circ)(*) & & & \leq(\bullet\circ)(*) \\ (\bullet*)(\circ) & \leq(\bullet\circ*) & & \\ (\bullet\circ*) & \leq(\bullet\circ*) & & \end{array}$	$(\bullet)(\circ)(*) \leq (\bullet)(\circ)(*)$ $(\bullet)(\circ)(*) \leq (\bullet\circ)(*)$ $(\bullet)(\circ)(*) \leq (\bullet*)(\circ)$ $(\bullet)(\circ)(*) \leq (\bullet)(\circ*)$ $(\bullet)(\circ)(*) \leq (\bullet\circ)(*)$ $(\bullet)(\circ)(*) \leq (\bullet\circ*)$ $(\bullet\circ)(*) \leq (\bullet\circ)(*)$ $(\bullet\circ)(*) \leq (\bullet\circ*)$ $(\bullet*)(\circ) \leq (\bullet*)(\circ)$ $(\bullet)(\circ*) \leq (\bullet)(\circ*)$ $(\bullet)(\circ*) \leq (\bullet\circ*)$ $(\bullet\circ*) \leq (\bullet\circ*)$
fong-spivak-seven-sketches EQ0056	97	0.330	`e:=\begin{array}{|c|} \hline s \\ \mathcal{Q} \\ z \\ s; s=z \\ \hline \end{array}`	$e := \boxed{\begin{array}{c} s \\ \mathcal{Q} \\ z \\ s;s=z \end{array}}$	$\mathcal{C} :=$ 
fong-spivak-seven-sketches EQ0109 (5.47)	175	0.331	`G_{R}:=\{\supset-, \circ-, \subset, \longrightarrow\} \cup\{-a-\mid a \in R\},`	$G_R := \{\supset -, \circ-, \subset, \longrightarrow\} \cup \{-a- \mid a \in R\},$	$G_R :=$ 
fong-spivak-seven-sketches EQ0059 (3.47)	106	0.333	`C:=\begin{array}{|c|} \hline s \\ \mathcal{Q} \\ b \\ s; s=s \\ \hline \end{array}`	$C := \boxed{\begin{array}{c} s \\ \mathcal{Q} \\ b \\ s;s=s \end{array}}$	$\mathcal{C} :=$ 
fong-spivak-seven-sketches EQ0113	178	0.335	`-\mapsto(1) \quad \text { and } \quad X \mapsto\left( \begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) \quad \text { and } \quad-a-\mapsto(a)`	$- \mapsto (1) \quad \text{and} \quad X \mapsto \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad \text{and} \quad -a- \mapsto (a)$	
fong-spivak-seven-sketches EQ0226	303	0.335	`\mathcal{X}(x, z)=\mathcal{X}(x, z) \otimes I \leq \mathfrak{X}(x, z) \otimes \mathcal{X}(z, z) \leq \bigvee_{y \in \mathcal{X}} \mathcal{X}(x, y) \otimes \mathcal{X}(y, z),`	$\mathcal{X}(x,z) = \mathcal{X}(x,z)\otimes I \leq \mathfrak{X}(x,z)\otimes\mathcal{X}(z,z) \leq \bigvee_{y\in\mathcal{X}} \mathcal{X}(x,y)\otimes\mathcal{X}(y,z),$	$\mathfrak{X}(x,z) = \mathfrak{X}(x,z)\otimes I \leq \mathfrak{X}(x,z)\otimes\mathfrak{X}(z,z) \leq \bigvee_{y\in\mathfrak{X}} \mathfrak{X}(x,y)\otimes\mathfrak{X}(y,z),$

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fong-spivak-seven-sketches EQ0068	115	0.352	`\mathcal{C} \underset{R}{\stackrel{L}{\Longleftrightarrow}} \mathcal{D}`	$\mathcal{C} \underset{R}{\overset{L}{\Longleftrightarrow}} \mathcal{D}$	$\mathcal{C} \underset{R}{\overset{L}{\Longleftrightarrow}} \mathcal{D}$
fong-spivak-seven-sketches EQ0206	290	0.362	`A, \quad A ; f, \quad A ; g, \quad A ; j, \quad B, \quad B ; h, \quad C, \quad C ; i, \quad D`	$A, \quad A ; f, \quad A ; g, \quad A ; j, \quad B, \quad B ; h, \quad C, \quad C ; i, \quad D$	$A, \quad A ; f, \quad A ; g, \quad A ; j, \quad B, \quad B ; h, \quad C, \quad C ; i, \quad D$
fong-spivak-seven-sketches EQ0098	156	0.366	`(x \times y)\left((x, y),\left(x^{\prime}, y^{\prime} \right)\right):=x\left(x, x^{\prime}\right) \otimes y \left(y, y^{\prime}\right) .`	$(x \times y)\left((x, y),\left(x^{\prime}, y^{\prime}\right)\right):=x\left(x, x^{\prime}\right) \otimes y \left(y, y^{\prime}\right) .$	$(\mathcal{X} \times \mathcal{Y})((x, y),(x', y')) := \mathcal{X}(x, x') \otimes \mathcal{Y}(y, y').$
fong-spivak-seven-sketches EQ0036	77	0.376	`\begin{array}{rlr} \mathcal{C}_{f}(c, d) \otimes_{W} \mathcal{C}_{f}(d, e) & =f(\mathcal{C}(c, d)) \otimes_{W} f(\mathcal{C}(d, e)) & \left(\text { definition of } \mathcal{C}_{f}\right) \\ & \leq f\left(\mathcal{C}(c, d) \otimes_{V} \mathcal{C}(d, e)\right) & (f \text { is monoidal monotone }) \\ & \leq f(\mathcal{C}(c, e)) & (\mathcal{C} \text { is } \mathcal{V}\text{-category }) \\ & =\mathcal{C}_{f}(c, e) & \left(\text { definition of } \mathscr{C}_{f}\right) \end{array}`	$\begin{array}{rlr} \mathcal{C}_{f}(c, d) \otimes_{W} \mathcal{C}_{f}(d, e) & =f(\mathcal{C}(c, d)) \otimes_{W} f(\mathcal{C}(d, e)) & \left(\text { definition of } \mathcal{C}_{f}\right) \\ & \leq f\left(\mathcal{C}(c, d) \otimes_{V} \mathcal{C}(d, e)\right) & (f \text { is monoidal monotone }) \\ & \leq f(\mathcal{C}(c, e)) & (\mathcal{C} \text { is } \mathcal{V}\text{-category }) \\ & =\mathcal{C}_{f}(c, e) & \left(\text { definition of } \mathscr{C}_{f}\right) \end{array}$	$\begin{array}{rlr} \mathcal{C}_{f}(c, d) \otimes_{W} \mathcal{C}_{f}(d, e) & =f(\mathcal{C}(c, d)) \otimes_{W} f(\mathcal{C}(d, e)) & \left(\text { definition of } \mathcal{C}_{f}\right) \\ & \leq f\left(\mathcal{C}(c, d) \otimes_{V} \mathcal{C}(d, e)\right) & (f \text { is monoidal monotone }) \\ & \leq f(\mathcal{C}(c, e)) & (\mathcal{C} \text { is } \mathcal{V}\text{-category }) \\ & =\mathcal{C}_{f}(c, e) & \left(\text { definition of } \mathcal{C}_{f}\right) \end{array}$
fong-spivak-seven-sketches EQ0142	227	0.424	`\begin{aligned} (g \circ f)\left(x_{1}, \ldots, x_{i-1}, w_{1}, \ldots, w_{m}\right. & \left., x_{i+1}, \ldots, x_{n}\right) \\ & =g\left(x_{1}, \ldots, x_{i-1}, f\left(w_{1}, \ldots, w_{m}\right), x_{i+1}, \ldots, x_{n}\right) \end{aligned}`	$\begin{aligned} (g \circ f)\left(x_{1}, \ldots, x_{i-1}, w_{1}, \ldots, w_{m}\right. & \left., x_{i+1}, \ldots, x_{n}\right) \\ & =g\left(x_{1}, \ldots, x_{i-1}, f\left(w_{1}, \ldots, w_{m}\right), x_{i+1}, \ldots, x_{n}\right) \end{aligned}$	$\begin{aligned} (g \circ_i f)(x_1, \ldots, x_{i-1}, w_1, \ldots, w_m, x_{i+1}, \ldots, x_n) \\ = g(x_1, \ldots, x_{i-1}, f(w_1, \ldots, w_m), x_{i+1}, \ldots, x_n) \end{aligned}$
fong-spivak-seven-sketches EQ0228	303	0.461	`\left(\alpha^{-1} ; \alpha\right)(x, z)=\bigvee_{(y, 1) \in \mathcal{X} \times \mathbf{1}} \alpha(x,(y, 1)) \otimes \alpha^{-1}((y, 1), z)=\bigvee_{y \in \mathcal{X}} x(x, y) \otimes x(y, z)=x(x, z) .`	$\left(\alpha^{-1} ; \alpha\right)(x, z)=\bigvee_{(y, 1) \in \mathcal{X} \times \mathbf{1}} \alpha(x,(y, 1)) \otimes \alpha^{-1}((y, 1), z)=\bigvee_{y \in \mathcal{X}} x(x, y) \otimes x(y, z)=x(x, z) .$	$(\alpha^{-1} \fatsemi \alpha)(x, z)=\bigvee_{(y, 1) \in \mathcal{X} \times \mathbf{1}} \alpha(x,(y, 1)) \otimes \alpha^{-1}((y, 1), z)=\bigvee_{y \in \mathcal{X}} \mathcal{X}(x, y) \otimes \mathcal{X}(y, z)=\mathcal{X}(x, z).$
fong-spivak-seven-sketches EQ0227	303	0.463	`\bigvee_{y \in \mathcal{X}} x(x, y) \otimes \mathcal{X}(y, z) \leq \bigvee_{y \in \mathcal{X}} x(x, z)=\mathscr{X}(x, z) .`	$\bigvee_{y \in \mathcal{X}} x(x, y) \otimes \mathcal{X}(y, z) \leq \bigvee_{y \in \mathcal{X}} x(x, z)=\mathscr{X}(x, z) .$	$\bigvee_{y \in \mathcal{X}} \mathcal{X}(x, y) \otimes \mathcal{X}(y, z) \leq \bigvee_{y \in \mathcal{X}} \mathcal{X}(x, z)=\mathcal{X}(x, z).$
fong-spivak-seven-sketches EQ0071 (3.75)	118	0.470	`!: \mathcal{C} \boldsymbol{\rightarrow} \mathbf{1} .`	$!: \mathcal{C} \boldsymbol{\rightarrow} \mathbf{1} .$	$!: \mathcal{C} \boldsymbol{\rightarrow} \mathbf{1}.$
fong-spivak-seven-sketches EQ0039 (2.77)	79	0.472	`(\mathcal{X} \times \mathcal{Y})\left(\left(x_{1}, y_{1}\right),\left(x_{2}, y_{2}\right)\right) \otimes(\mathcal{X} \times \mathcal{Y})\left(\left(x_{2}, y_{2}\right),\left(x_{3}, y_{3}\right)\right) \leq(\mathfrak{X} \times \mathcal{Y})\left(\left(x_{1}, y_{1}\right),\left(x_{3}, y_{3}\right)\right) .`	$(\mathcal{X} \times \mathcal{Y})\left(\left(x_{1}, y_{1}\right),\left(x_{2}, y_{2}\right)\right) \otimes(\mathcal{X} \times \mathcal{Y})\left(\left(x_{2}, y_{2}\right),\left(x_{3}, y_{3}\right)\right) \leq(\mathfrak{X} \times \mathcal{Y})\left(\left(x_{1}, y_{1}\right),\left(x_{3}, y_{3}\right)\right) .$	$(\mathcal{X} \times \mathcal{Y})\left(\left(x_{1}, y_{1}\right),\left(x_{2}, y_{2}\right)\right) \otimes(\mathcal{X} \times \mathcal{Y})\left(\left(x_{2}, y_{2}\right),\left(x_{3}, y_{3}\right)\right) \leq(\mathcal{X} \times \mathcal{Y})\left(\left(x_{1}, y_{1}\right),\left(x_{3}, y_{3}\right)\right).$
fong-spivak-seven-sketches EQ0163	257	0.487	`\Omega_{\text {Grph }}=(0,0 ; 0) \subset 0 \underset{(V, 0 ; 0)}{\stackrel{(0, V ; 0)}{\longleftarrow}} \underset{(V, V ; A)}{V}^{(V, V ; 0)}`	$\Omega_{\text {Grph }}=(0,0 ; 0) \subset 0 \underset{(V, 0 ; 0)}{\overset{(0, V ; 0)}{\longleftarrow}} \underset{(V, V ; A)}{V}^{(V, V ; 0)}$	$\Omega_{\text {Grph }}=(0,0 ; 0) \subset 0 \underset{(V, 0 ; 0)}{\overset{(0, V ; 0)}{\longleftarrow}} \underset{(V, V ; A)}{V}^{(V, V ; 0)}$

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fong-spivak-seven-sketches_EQ0258	317	0.494	\left[\mathrm{id}_{A},!_{A}\right] \stackrel{\circ}{9} \iota_{A}=\left[\mathrm{id}_{A} \stackrel{\circ}{\circ} \iota_{A},!_{A}^{\circ} \stackrel{\circ}{\circ}_{ \iota_{A}}\right]=\left[\iota_{A},!_{A+\varnothing} \right]=\left[\iota_{A}, \iota_{\varnothing}\right]= \mathrm{id}_{A+\varnothing} .	$\left[\mathrm{id}_{A},!_{A}\right] \overset{\circ}{9} \iota_{A}=\left[\mathrm{id}_{A} \overset{\circ}{\circ} \iota_{A},!_{A}^{\circ} \overset{\circ}{\circ}_{ \iota_{A}}\right]=\left[\iota_{A},!_{A+\varnothing} \right]=\left[\iota_{A}, \iota_{\varnothing}\right]= \mathrm{id}_{A+\varnothing} .$	$\left[\mathrm{id}_{A},!_{A}\right] \overset{\circ}{9} \iota_{A}=\left[\mathrm{id}_{A} \overset{\circ}{\circ} \iota_{A},!_{A}^{\circ} \overset{\circ}{\circ}_{ \iota_{A}}\right]=\left[\iota_{A},!_{A+\varnothing} \right]=\left[\iota_{A}, \iota_{\varnothing}\right]= \mathrm{id}_{A+\varnothing} .$
fong-spivak-seven-sketches_EQ0074	119	0.500	\begin{array}{c|c} 1 \\ \hline \text { Bob-Grace-Pat-Emmy } \\ \text { Sue-Doug } \end{array}	$\begin{array}{c\|c} 1 \\ \hline \text { Bob-Grace-Pat-Emmy } \\ \text { Sue-Doug } \end{array}$	$\begin{array}{c\|c} 1 \\ \hline \text { Bob-Grace-Pat-Emmy } \\ \text { Sue-Doug } \end{array}$
fong-spivak-seven-sketches_EQ0223	299	0.512	\begin{aligned} \Phi=M_{X}^{3} * M_{\Phi} * M_{Y}^{2} & = \left(\begin{array}{cccc} 0 & 6 & 3 & 11 \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ 11 & 9 & 6 & 0 \end{array}\right) \left(\begin{array}{ccc} \infty & \infty & \infty \\ 11 & \infty & \infty \\ \infty & \infty & \infty \\ \infty & 9 & \infty \end{array}\right)\left(\begin{array}{lll} 0 & 4 & 3 \\ 3 & 0 & 6 \\ 7 & 4 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & \infty \\ 11 & 14 & \infty \\ 14 & 17 & \infty \\ 20 & 9 & \infty \end{array}\right)\left(\begin{array}{lll} 0 & 4 & 3 \\ 3 & 0 & 6 \\ 7 & 4 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right) \end{aligned}	$\begin{aligned} \Phi=M_{X}^{3} * M_{\Phi} * M_{Y}^{2} & = \left(\begin{array}{cccc} 0 & 6 & 3 & 11 \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ 11 & 9 & 6 & 0 \end{array}\right) \left(\begin{array}{ccc} \infty & \infty & \infty \\ 11 & \infty & \infty \\ \infty & \infty & \infty \\ \infty & 9 & \infty \end{array}\right)\left(\begin{array}{lll} 0 & 4 & 3 \\ 3 & 0 & 6 \\ 7 & 4 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & \infty \\ 11 & 14 & \infty \\ 14 & 17 & \infty \\ 20 & 9 & \infty \end{array}\right)\left(\begin{array}{lll} 0 & 4 & 3 \\ 3 & 0 & 6 \\ 7 & 4 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right) \end{aligned}$	$\begin{aligned} \Phi=M_{X}^{3} * M_{\Phi} * M_{Y}^{2} & = \left(\begin{array}{cccc} 0 & 6 & 3 & 11 \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ 11 & 9 & 6 & 0 \end{array}\right) \left(\begin{array}{ccc} \infty & \infty & \infty \\ 11 & \infty & \infty \\ \infty & \infty & \infty \\ \infty & 9 & \infty \end{array}\right)\left(\begin{array}{lll} 0 & 4 & 3 \\ 3 & 0 & 6 \\ 7 & 4 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & \infty \\ 11 & 14 & \infty \\ 14 & 17 & \infty \\ 20 & 9 & \infty \end{array}\right)\left(\begin{array}{lll} 0 & 4 & 3 \\ 3 & 0 & 6 \\ 7 & 4 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right) \end{aligned}$
fong-spivak-seven-sketches_EQ0021	58	0.515	\left.\left.\frac{\bar{x}}{y}\right\}=\frac{x \otimes y}{z}\right\}=\left\{\frac{x}{y \otimes z}=\left\{ \frac{y}{z}\right.\right.	$\left.\left.\frac{\bar{x}}{y}\right\}=\frac{x \otimes y}{z}\right\}=\left\{\frac{x}{y \otimes z}=\left\{ \frac{y}{z}\right.\right.$	$\left.\left.\frac{\bar{x}}{y}\right\}=\frac{x \otimes y}{z}\right\}=\left\{\frac{x}{y \otimes z}=\left\{ \frac{y}{z}\right.\right.$
fong-spivak-seven-sketches_EQ0069	115	0.520	\text { Set } \underset{(-)^{B}}{\stackrel{-\times B}{\Rightarrow}} \text { Set } \quad \operatorname{Set}(A \times B, C) \cong \operatorname{Set}\left(A, C^{B} \right)	$\text { Set } \underset{(-)^{B}}{\stackrel{-\times B}{\Rightarrow}} \text { Set } \quad \operatorname{Set}(A \times B, C) \cong \operatorname{Set}\left(A, C^{B}\right)$	$\text { Set } \underset{(-)^{B}}{\stackrel{-\times B}{\Rightarrow}} \text { Set } \quad \operatorname{Set}(A \times B, C) \cong \operatorname{Set}\left(A, C^{B}\right)$
fong-spivak-seven-sketches_EQ0116	186	0.520	\mathrm{B}(-\mathrm{C})=\{(x,(x, x)) \mid x \in R\} .	$\mathrm{B}(-\mathrm{C})=\{(x,(x, x)) \mid x \in R\} .$	$\mathrm{B}(-\mathrm{C})=\{(x,(x, x)) \mid x \in R\} .$
fong-spivak-seven-sketches_EQ0257	317	0.522	\mathrm{id}_{A}+\mathrm{id}_{B}=\left[\mathrm{id}_{A} \stackrel{\circ}{\circ} \iota_{A}, \mathrm{id}_{B} \stackrel{\circ}{\circ} \iota_{B}\right]=\left[\iota_{A}, \iota_{B}\right]=\mathrm{id}_{A+B} .	$\mathrm{id}_{A}+\mathrm{id}_{B}=\left[\mathrm{id}_{A} \overset{\circ}{\circ} \iota_{A}, \mathrm{id}_{B} \overset{\circ}{\circ} \iota_{B}\right]=\left[\iota_{A}, \iota_{B}\right]=\mathrm{id}_{A+B} .$	$\mathrm{id}_{A}+\mathrm{id}_{B}=\left[\mathrm{id}_{A} \overset{\circ}{\circ} \iota_{A}, \mathrm{id}_{B} \overset{\circ}{\circ} \iota_{B}\right]=\left[\iota_{A}, \iota_{B}\right]=\mathrm{id}_{A+B} .$

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fong-spivak-seven-sketches EQ0054 (3.11)	95	0.526	`\mathbf{3}:=\operatorname{Free}\left(\stackrel{v_{1}}{ \bullet} \xrightarrow{f_{1}} \stackrel{v_{2}}{ \longrightarrow} \xrightarrow{f_{2}} \stackrel{v_{3}}{ \bullet}\right.`	$\mathbf{3} := \operatorname{Free}\left(\overset{v_1}{\bullet} \xrightarrow{f_1} \overset{v_2}{\longrightarrow} \xrightarrow{f_2} \overset{v_3}{\bullet}\right.$	$\mathbf{3} := \operatorname{Free}\left(\boxed{\overset{v_1}{\bullet} \xrightarrow{f_1} \overset{v_2}{\bullet} \xrightarrow{f_2} \overset{v_3}{\bullet}}\right)$
fong-spivak-seven-sketches EQ0005	33	0.539	`p=g(f(p)) \quad \text { and } \quad q=f(g(q)) .`	$p=g(f(p)) \quad \text{ and } \quad q=f(g(q)).$	$p=g(f(p)) \quad \text{ and } \quad q=f(g(q)).$
fong-spivak-seven-sketches EQ0078 (4.3)	132	0.549	`\Phi: x^{\mathrm{op}} \times y \rightarrow \text { Bool. }`	$\Phi: x^{\mathrm{op}} \times y \rightarrow \text{ Bool.}$	$\Phi\colon \mathcal{X}^{\mathrm{op}} \times \mathcal{Y} \to \mathbf{Bool}.$
fong-spivak-seven-sketches EQ0091	142	0.550	`\widehat{F}(p, q):=Q(F(p), q) \text { and } \check{F}(q, p):=Q(q, F(p))`	$\widehat{F}(p,q) := Q(F(p),q) \text{ and } \check{F}(q,p) := Q(q,F(p))$	$\widehat{F}(p,q) := \mathcal{Q}(F(p),q) \quad \text{and} \quad \check{F}(q,p) := \mathcal{Q}(q,F(p))$
fong-spivak-seven-sketches EQ0104 (5.17)	165	0.566	`G+G^{\prime}:=\left(\left(V \sqcup V^{\prime}\right),[ \text { in }, \text { in' }],[\text { out }, \text { out' }],\left(\iota \sqcup \iota^{\prime}\right)\right) .`	$G+G' := ((V \sqcup V'), [\text{ in }, \text{ in' }], [\text{ out }, \text{ out' }], (\iota \sqcup \iota')).$	$G+G' := \big((V \sqcup V'), [in, in'], [out, out'], (\iota \sqcup \iota')\big).$
fong-spivak-seven-sketches EQ0221	298	0.568	`x\left(x^{\prime}, x\right) \otimes y\left(y, y^{\prime} \right) \leq \Phi(x, y) \multimap \Phi\left(x^{\prime}, y^{\prime}\right)`	$x\left(x^{\prime}, x\right) \otimes y\left(y, y^{\prime}\right) \leq \Phi(x, y) \multimap \Phi\left(x^{\prime}, y^{\prime}\right)$	$\mathcal{X}(x', x) \otimes \mathcal{Y}(y, y') \leq \Phi(x, y) \multimap \Phi(x', y')$
fong-spivak-seven-sketches EQ0253	313	0.570	`\left\{(y, z) \mid \text { there exists } x \in R^{m} \text { such that } y=S(g)(x) \text { and } S(h)(x)=z \right\} \text {. }`	$\{(y, z) \mid \text{ there exists } x \in R^m \text{ such that } y=S(g)(x) \text{ and } S(h)(x)=z\}.$	$\{(y, z) \mid \text{ there exists } x \in R^m \text{ such that } y=S(g)(x) \text{ and } S(h)(x)=z\}.$
fong-spivak-seven-sketches EQ0043	82	0.593	`2 \mathrm{H}_{2} \mathrm{O} \rightarrow\left(2 \mathrm{Na} \rightarrow\left(2 \mathrm{NaOH}+ \mathrm{H}_{2}\right)\right)`	$2\mathrm{H}_2\mathrm{O} \rightarrow (2\mathrm{Na} \rightarrow (2\mathrm{NaOH} + \mathrm{H}_2))$	$2\mathrm{H}_2\mathrm{O} \rightarrow (2\mathrm{Na} \multimap (2\mathrm{NaOH} + \mathrm{H}_2))$
fong-spivak-seven-sketches EQ0179	272	0.598	`h, \quad 1, \quad 2, \quad 3 .`	$h, \quad 1, \quad 2, \quad 3.$	$h, \quad 1, \quad 2, \quad 3.$
fong-spivak-seven-sketches EQ0002 (1.15)	21	0.658	`A=\bigcup_{p \in P} A_{p} \quad \text { and } \quad \text { if } p \neq q \text { then } A_{p} \cap A_{q}= \varnothing .`	$A=\bigcup_{p \in P} A_p \quad \text{ and } \quad \text{ if } p \neq q \text{ then } A_p \cap A_q=\varnothing.$	$A=\bigcup_{p \in P} A_p \quad \text{ and } \quad \text{ if } p \neq q \text{ then } A_p \cap A_q=\varnothing.$
fong-spivak-seven-sketches EQ0158 (7.37)	250	0.658	`\operatorname{Sec}_{f}(U):=\{s: U \rightarrow X \mid(s ; f)(u)=u \text { for all } u \in U\} .`	$\operatorname{Sec}_f(U) := \{s: U \rightarrow X \mid (s; f)(u) = u \text{ for all } u \in U\}.$	$\operatorname{Sec}_f(U) := \{s: U \rightarrow X \mid (s \fatsemi f)(u) = u \text{ for all } u \in U\}.$
fong-spivak-seven-sketches EQ0147 (7.2)	235	0.661	`((A=\mathrm{go}) \Rightarrow \ddot{S}>1) \wedge((A=\text { stop }) \Rightarrow \ddot{S}=0) .`	$((A=\mathrm{go}) \Rightarrow \ddot{S}>1) \wedge((A=\text{ stop }) \Rightarrow \ddot{S}=0).$	$\big((A=\mathrm{go}) \Rightarrow \ddot{S}>1\big) \wedge \big((A=\mathrm{stop}) \Rightarrow \ddot{S}=0\big).$
fong-spivak-seven-sketches EQ0191	282	0.677	`\begin{array}{rlr} t+u & \leq(v+w)+u & (\text { monotonicity, } t \leq v+w, u \leq u) \\ & =v+(w+u) & (\text { associativity }) \\ & \leq v+(x+z) & (\text { monotonicity, } v \leq v, w+u \leq x+v) \\ & =(v+x)+z & (\text { associativitiy }) \\ & \leq y+z . & (\text { monotonicity, } v+x \leq y, z \leq z) \end{array}`	$\begin{array}{rlr} t+u & \leq(v+w)+u & (\text{ monotonicity, } t \leq v+w, u \leq u) \\ & =v+(w+u) & (\text{ associativity }) \\ & \leq v+(x+z) & (\text{ monotonicity, } v \leq v, w+u \leq x+v) \\ & =(v+x)+z & (\text{ associativitiy }) \\ & \leq y+z . & (\text{ monotonicity, } v+x \leq y, z \leq z) \end{array}$	$\begin{array}{rlr} t+u & \leq(v+w)+u & (\text{monotonicity, } t \leq v+w, u \leq u) \\ & =v+(w+u) & (\text{associativity}) \\ & \leq v+(x+z) & (\text{monotonicity, } v \leq v, w+u \leq x+v) \\ & =(v+x)+z & (\text{associativitiy}) \\ & \leq y+z . & (\text{monotonicity, } v+x \leq y, z \leq z) \end{array}$

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fong-spivak-seven-sketches EQ0224	300	0.684	`\begin{aligned} \Phi: \Psi & =\left(M_{X}^{3} * M_{ \Phi} * M_{Y}^{2}\right) *\left(M_{Y}^{2} * M_{\Psi} * M_{Z}^{3}\right) \\ & =M_{X}^{3} * M_{\Phi} * M_{Y}^{4} * M_{\Psi} * M_{Z}^{3} \\ & =\left(M_{X}^{3} * M_{\Phi} * M_{Y}^{2}\right) * M_{\Psi} * M_{Z}^{3} \\ & =\Phi * M_{\Psi} * M_{Z}^{3} \\ & =\left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right)\left(\begin{array}{cccc} \infty & \infty & \infty & \infty \\ \infty & \infty & 0 & \infty \\ 4 & \infty & \infty & 4 \end{array}\right) \left(\begin{array}{cccc} 0 & 2 & 4 & 5 \\ 4 & 0 & 2 & 3 \\ 2 & 4 & 0 & 1 \\ 1 & 3 & 5 & 0 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right)\left(\begin{array}{cccc} \infty & \infty & \infty & \infty \\ 2 & 4 & 0 & 1 \\ 4 & 6 & 8 & 4 \end{array}\right) \\ & =\left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right)\left(\begin{array}{cccc} \infty & \infty & \infty & \infty \\ 2 & 4 & 0 & 1 \\ 4 & 6 & 8 & 4 \end{array}\right) \\ & =\left(\begin{array}{cccc} 22 & 24 & 20 & 21 \\ 16 & 18 & 14 & 15 \\ 19 & 21 & 17 & 18 \\ 11 & 13 & 9 & 10 \end{array}\right) \end{aligned}`	$\begin{aligned} \Phi : \Psi &= \left(M_{X}^{3} * M_{\Phi} * M_{Y}^{2}\right) * \left(M_{Y}^{2} * M_{\Psi} * M_{Z}^{3}\right) \\ &= M_{X}^{3} * M_{\Phi} * M_{Y}^{4} * M_{\Psi} * M_{Z}^{3} \\ &= \left(M_{X}^{3} * M_{\Phi} * M_{Y}^{2}\right) * M_{\Psi} * M_{Z}^{3} \\ &= \Phi * M_{\Psi} * M_{Z}^{3} \\ &= \left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right)\left(\begin{array}{cccc} \infty & \infty & \infty & \infty \\ \infty & \infty & 0 & \infty \\ 4 & \infty & \infty & 4 \end{array}\right) \left(\begin{array}{cccc} 0 & 2 & 4 & 5 \\ 4 & 0 & 2 & 3 \\ 2 & 4 & 0 & 1 \\ 1 & 3 & 5 & 0 \end{array}\right) \\ &= \left(\begin{array}{ccc} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{array}\right)\left(\begin{array}{cccc} \infty & \infty & \infty & \infty \\ 2 & 4 & 0 & 1 \\ 4 & 6 & 8 & 4 \end{array}\right) \\ &= \left(\begin{array}{cccc} 22 & 24 & 20 & 21 \\ 16 & 18 & 14 & 15 \\ 19 & 21 & 17 & 18 \\ 11 & 13 & 9 & 10 \end{array}\right) \end{aligned}$	$\begin{aligned} \Phi \fatsemi \Psi &= (M_X^3 * M_\Phi * M_Y^2) * (M_Y^2 * M_\Psi * M_Z^3) \\ &= M_X^3 * M_\Phi * M_Y^4 * M_\Psi * M_Z^3 \\ &= (M_X^3 * M_\Phi * M_Y^2) * M_\Psi * M_Z^3 \\ &= \Phi * M_\Psi * M_Z^3 \\ &= \begin{pmatrix} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{pmatrix} \begin{pmatrix} \infty & \infty & \infty & \infty \\ \infty & \infty & 0 & \infty \\ 4 & \infty & \infty & 4 \end{pmatrix} \begin{pmatrix} 0 & 2 & 4 & 5 \\ 4 & 0 & 2 & 3 \\ 2 & 4 & 0 & 1 \\ 1 & 3 & 5 & 0 \end{pmatrix} \\ &= \begin{pmatrix} 17 & 20 & 20 \\ 11 & 14 & 14 \\ 14 & 17 & 17 \\ 12 & 9 & 15 \end{pmatrix} \begin{pmatrix} \infty & \infty & \infty & \infty \\ 2 & 4 & 0 & 1 \\ 4 & 6 & 8 & 4 \end{pmatrix} \\ &= \begin{pmatrix} 22 & 24 & 20 & 21 \\ 16 & 18 & 14 & 15 \\ 19 & 21 & 17 & 18 \\ 11 & 13 & 9 & 10 \end{pmatrix} \end{aligned}$
fong-spivak-seven-sketches EQ0120 (5.81)	187	0.690	`\mathbf{S F G}_{R}^{+}:=\text {Free }\left(G_{R} \sqcup G_{R}^{\mathrm{op}}\right) .`	$\mathbf{SFG}_R^+ := \text{Free }\left(G_R \sqcup G_R^{\mathrm{op}}\right).$	$\mathbf{SFG}_R^+ := \text{Free }\left(G_R \sqcup G_R^{\mathrm{op}}\right).$
fong-spivak-seven-sketches EQ0081 (◇)	133	0.690	`x\left(x^{\prime}, x\right) \otimes \Phi(x, y) \otimes y \left(y, y^{\prime}\right) \leq \Phi\left(x^{\prime}, y^{ \prime}\right) .`	$x\left(x^{\prime}, x\right) \otimes \Phi(x, y) \otimes y\left(y, y^{\prime}\right) \leq \Phi\left(x^{\prime}, y^{\prime}\right).$	$\mathcal{X}(x', x) \otimes \Phi(x, y) \otimes \mathcal{Y}(y, y') \leq \Phi(x', y').$
fong-spivak-seven-sketches EQ0140 (6.81)	220	0.725	`\begin{aligned} \psi_{V, V^{\prime}}: \operatorname{Circ}(V) \times \operatorname{Circ} \left(V^{\prime}\right) & \longrightarrow \operatorname{Circ}\left(V+V^{\prime}\right) ; \\ \left((V, A, s, t, \ell),\left(V^{\prime}, A^{\prime}, s^{\prime}, t^{\prime}, \ell^{\prime}\right)\right) & \longmapsto\left(V+V^{\prime}, A+A^{\prime}, s+s^{ \prime}, t+t^{\prime},\left[\ell, \ell^{\prime}\right] \right) . \end{aligned}`	$\begin{aligned} \psi_{V,V'} : \operatorname{Circ}(V) \times \operatorname{Circ}(V') &\longrightarrow \operatorname{Circ}(V+V'); \\ ((V,A,s,t,\ell),(V',A',s',t',\ell')) &\longmapsto (V+V', A+A', s+s', t+t', [\ell,\ell']). \end{aligned}$	$\begin{aligned} \psi_{V,V'} : \mathsf{Circ}(V) \times \mathsf{Circ}(V') &\longrightarrow \mathsf{Circ}(V+V'); \\ \big((V,A,s,t,\ell),(V',A',s',t',\ell')\big) &\longmapsto (V+V', A+A', s+s', t+t', [\ell,\ell']). \end{aligned}$
fong-spivak-seven-sketches EQ0222	298	0.731	`\mathcal{X}\left(x^{\prime}, x\right) \otimes \Phi(x, y) \otimes y\left(y, y^{\prime}\right) \leq \Phi\left(x^{ \prime}, y^{\prime}\right) .`	$\mathcal{X}\left(x^{\prime}, x\right) \otimes \Phi(x, y) \otimes y\left(y, y^{\prime}\right) \leq \Phi\left(x^{\prime}, y^{\prime}\right).$	$\mathcal{X}(x', x) \otimes \Phi(x, y) \otimes \mathcal{Y}(y, y') \leq \Phi(x', y').$

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fong-spivak-seven-sketches EQ0132	212	0.742	`\begin{array}{rrrr} \operatorname{in}(\mu):=2, & \operatorname{in}(\eta):=0, & \operatorname{in}(\delta):=1, & \operatorname{in}(\epsilon):=1, \\ \operatorname{out}(\mu):=1, & \operatorname{out}(\eta):=1, & \operatorname{out}(\delta):=2, & \operatorname{out}(\epsilon):=0 . \end{array}`	$\begin{array}{rrrr} \operatorname{in}(\mu):=2, & \operatorname{in}(\eta):=0, & \operatorname{in}(\delta):=1, & \operatorname{in}(\epsilon):=1, \\ \operatorname{out}(\mu):=1, & \operatorname{out}(\eta):=1, & \operatorname{out}(\delta):=2, & \operatorname{out}(\epsilon):=0. \end{array}$	$\begin{array}{rrrr} in(\mu):=2, & in(\eta):=0, & in(\delta):=1, & in(\epsilon):=1, \\ out(\mu):=1, & out(\eta):=1, & out(\delta):=2, & out(\epsilon):=0. \end{array}$
fong-spivak-seven-sketches EQ0097	155	0.755	`\[ \alpha: \beta:=\iota_{A \sqcup C}^{*}\left(\left(\iota_{A \sqcup B}\right)!(\alpha) \vee\left(\iota_{B \sqcup C}\right)!(\beta)\right) . \] }`	$\alpha : \beta := \iota_{A \sqcup C}^{*}\left(\left(\iota_{A \sqcup B}\right)!(\alpha) \vee\left(\iota_{B \sqcup C}\right)!(\beta)\right) .$	$\alpha \mathbin{⨟} \beta := \iota_{A \sqcup C}^{*}((\iota_{A \sqcup B})_!(\alpha) \vee (\iota_{B \sqcup C})_!(\beta)).$
fong-spivak-seven-sketches EQ0230	304	0.759	`\begin{aligned} & \quad \bigvee_{a, b, c, d, e \in X} \alpha^{-1}(x,(a, 1)) \otimes\left(\mathrm{U}_{X} \times \eta_{X}\right)((a, 1),(b, c, d)) \\ & = \bigvee_{a, b, c, d, e \in X} \alpha^{-1}(x,(a, 1)) \otimes \mathrm{U}_{X}(a, b) \otimes \eta_{X}(1, c, d) \quad \otimes\left(\epsilon_{X} \times \mathrm{U}_{X}\right)((b, c, d),(1, e)) \otimes \alpha((1, e), y) \\ & =\bigvee_{a, b, c, d, e \in X} x(x, a) \otimes X(a, b) \otimes X(c, d) \otimes X(b, c) \otimes X(d, e) \otimes X(e, y) \\ & =X(x, y) \end{aligned} \quad \otimes \epsilon_{X}(b, c, 1) \otimes \mathrm{U}_{X}(d, e) \otimes \alpha((1, e), y)`	$\begin{aligned} & \bigvee_{a, b, c, d, e \in X} \alpha^{-1}(x,(a, 1)) \otimes\left(\mathrm{U}_{X} \times \eta_{X}\right)((a, 1),(b, c, d)) \\ & = \bigvee_{a, b, c, d, e \in X} \alpha^{-1}(x,(a, 1)) \otimes \mathrm{U}_{X}(a, b) \otimes \eta_{X}(1, c, d) \quad \otimes\left(\epsilon_{X} \times \mathrm{U}_{X}\right)((b, c, d),(1, e)) \otimes \alpha((1, e), y) \\ & =\bigvee_{a, b, c, d, e \in X} x(x, a) \otimes X(a, b) \otimes X(c, d) \otimes X(b, c) \otimes X(d, e) \otimes X(e, y) \\ & =X(x, y) \end{aligned} \quad \otimes \epsilon_{X}(b, c, 1) \otimes \mathrm{U}_{X}(d, e) \otimes \alpha((1, e), y)$	$\begin{aligned} & \bigvee_{a, b, c, d, e \in \mathcal{X}} \alpha^{-1}(x,(a, 1)) \otimes\left(\mathrm{U}_{\mathcal{X}} \times \eta_{\mathcal{X}}\right)((a, 1),(b, c, d)) \\ & = \bigvee_{a, b, c, d, e \in \mathcal{X}} \alpha^{-1}(x,(a, 1)) \otimes \mathrm{U}_{\mathcal{X}}(a, b) \otimes \eta_{\mathcal{X}}(1, c, d) \quad \otimes\left(\epsilon_{\mathcal{X}} \times \mathrm{U}_{\mathcal{X}}\right)((b, c, d),(1, e)) \otimes \alpha((1, e), y) \\ & =\bigvee_{a, b, c, d, e \in \mathcal{X}} \mathcal{X}(x, a) \otimes \mathcal{X}(a, b) \otimes \mathcal{X}(c, d) \otimes \mathcal{X}(b, c) \otimes \mathcal{X}(d, e) \otimes \mathcal{X}(e, y) \\ & =\mathcal{X}(x, y) \end{aligned} \quad \otimes \epsilon_{\mathcal{X}}(b, c, 1) \otimes \mathrm{U}_{\mathcal{X}}(d, e) \otimes \alpha((1, e), y)$
fong-spivak-seven-sketches EQ0242	310	0.775	`c_{n}:=-c:(1+-c):(1+1+-c): \cdots:(1+\cdots+1+-c): 1 \rightarrow n`	$c_{n} := -c : (1+-c) : (1+1+-c) : \cdots : (1+\cdots+1+-c) : 1 \rightarrow n$	$c_{n} := -c \mathbin{⨟} (1+-c) \mathbin{⨟} (1+1+-c) \mathbin{⨟} \cdots \mathbin{⨟} (1+\cdots+1+-c) : 1 \rightarrow n$
fong-spivak-seven-sketches EQ0156	248	0.780	`\mathbf{O p}_{1}:=\{\varnothing,\{1\}, X\} \quad \text { and } \quad \mathbf{O p}_{2}:=\{\varnothing,\{2\}, X\}`	$\mathbf{Op}_{1} := \{\varnothing, \{1\}, X\} \quad \text{ and } \quad \mathbf{Op}_{2} := \{\varnothing, \{2\}, X\}$	$\mathbf{Op}_{1} := \{\varnothing, \{1\}, X\} \quad \text{ and } \quad \mathbf{Op}_{2} := \{\varnothing, \{2\}, X\}$
fong-spivak-seven-sketches EQ0219	298	0.795	`\begin{aligned} \Lambda(\text { monoid }, \text { nothing }) & =\Lambda(\text { monoid }, \text { this book }) \\ & =\Lambda(\text { preorder, this book }) \\ \Lambda(\text { preorder, nothing }) & =\Lambda(\text { category, nothing }) =\text { false. } \end{aligned} \quad =\Lambda(\text { category, this book }) =\text { true }`	$\begin{aligned} \Lambda(\text { monoid }, \text { nothing }) & =\Lambda(\text { monoid }, \text { this book }) \\ & =\Lambda(\text { preorder, this book }) \\ \Lambda(\text { preorder, nothing }) & =\Lambda(\text { category, nothing }) =\text { false. } \end{aligned} \quad =\Lambda(\text { category, this book }) =\text { true }$	$\begin{aligned} \Lambda(\text{monoid, nothing}) &= \Lambda(\text{monoid, this book}) \\ &= \Lambda(\text{preorder, this book}) \\ \Lambda(\text{preorder, nothing}) &= \Lambda(\text{category, nothing}) = \texttt{false}. \end{aligned} \quad = \Lambda(\text{category, this book}) = \texttt{true}$
fong-spivak-seven-sketches EQ0077	124	0.797	`\begin{aligned} & \lim _{\mathcal{J}} D:=\left\{ \left(d_{1}, \ldots, d_{n}\right) \mid d_{i} \in D \left(v_{i}\right) \text { for all } 1 \leq i \leq n \right. \text { and } \\ & \left.\qquad \text { for all } a: v_{i} \rightarrow v_{j} \in A, \text { we have } D(a) \left(d_{i}\right)=d_{j}\right\} . \end{aligned}`	$\begin{aligned} & \lim_{\mathcal{J}} D:=\left\{ \left(d_{1}, \ldots, d_{n}\right) \mid d_{i} \in D \left(v_{i}\right) \text { for all } 1 \leq i \leq n \right. \text { and } \\ & \left.\qquad \text { for all } a: v_{i} \rightarrow v_{j} \in A, \text { we have } D(a) \left(d_{i}\right)=d_{j}\right\} . \end{aligned}$	$\begin{aligned} & \lim_{\mathcal{J}} D:=\left\{ \left(d_{1}, \ldots, d_{n}\right) \mid d_{i} \in D \left(v_{i}\right) \text { for all } 1 \leq i \leq n \right. \text { and } \\ & \left.\qquad \text { for all } a: v_{i} \rightarrow v_{j} \in A, \text { we have } D(a)(d_{i})=d_{j}\right\}. \end{aligned}$
fong-spivak-seven-sketches EQ0131	211	0.808	`m \text { legs }\{\lessapprox \in\} n \text { legs }`	$m \text{ legs } \{\lessapprox \in\} n \text{ legs}$	$m \text{ legs} \left\{ \right. \left. \right\} n \text{ legs}$

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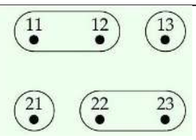
fong-spivak-seven-sketches_EQ0193	286	0.825	`\begin{aligned} (x & \times y)\left(\left(x_{1}, y_{1} \right),\left(x_{2}, y_{2}\right)\right) \otimes(x \times y)\left(\left(x_{2}, y_{2}\right),\left(x_{3}, y_{3}\right)\right) \\ & =x\left(x_{1}, x_{2}\right) \otimes y\left(y_{1}, y_{2}\right) \otimes x\left(x_{2}, x_{3}\right) \otimes y\left(y_{2}, y_{3}\right) \\ & =x \left(x_{1}, x_{2}\right) \otimes x\left(x_{2}, x_{3}\right) \otimes y\left(y_{1}, y_{2}\right) \otimes y\left(y_{2}, y_{3}\right) \\ & \leq x\left(x_{1}, x_{3}\right) \otimes y\left(y_{1}, y_{3}\right) \\ & =(x \times y)\left(\left(x_{1}, y_{1}\right),\left(x_{3}, y_{3}\right)\right) . \end{aligned}`	$\begin{aligned} &(x \times y)\left(\left(x_{1}, y_{1}\right),\left(x_{2}, y_{2}\right)\right) \otimes(x \times y)\left(\left(x_{2}, y_{2}\right),\left(x_{3}, y_{3}\right)\right) \\ &\quad= x\left(x_{1}, x_{2}\right) \otimes y\left(y_{1}, y_{2}\right) \otimes x\left(x_{2}, x_{3}\right) \otimes y\left(y_{2}, y_{3}\right) \\ &\quad= x\left(x_{1}, x_{2}\right) \otimes x\left(x_{2}, x_{3}\right) \otimes y\left(y_{1}, y_{2}\right) \otimes y\left(y_{2}, y_{3}\right) \\ &\quad\leq x\left(x_{1}, x_{3}\right) \otimes y\left(y_{1}, y_{3}\right) \\ &\quad=(x \times y)\left(\left(x_{1}, y_{1}\right),\left(x_{3}, y_{3}\right)\right) . \end{aligned}$	$\begin{aligned} &(\mathcal{X} \times \mathcal{Y})\big((x_1, y_1), (x_2, y_2)\big) \otimes (\mathcal{X} \times \mathcal{Y})\big((x_2, y_2), (x_3, y_3)\big) \\ &\quad= \mathcal{X}(x_1, x_2) \otimes \mathcal{Y}(y_1, y_2) \otimes \mathcal{X}(x_2, x_3) \otimes \mathcal{Y}(y_2, y_3) \\ &\quad= \mathcal{X}(x_1, x_2) \otimes \mathcal{X}(x_2, x_3) \otimes \mathcal{Y}(y_1, y_2) \otimes \mathcal{Y}(y_2, y_3) \\ &\quad\leq \mathcal{X}(x_1, x_3) \otimes \mathcal{Y}(y_1, y_3) \\ &\quad= (\mathcal{X} \times \mathcal{Y})\big((x_1, y_1), (x_3, y_3)\big). \end{aligned}$
fong-spivak-seven-sketches_EQ0172	264	0.827	`\mathbb{I} \mathbb{R}:=\{[d, u] \subseteq \mathbb{R} \mid d \leq u\} .`	$\mathbb{I}\mathbb{R} := \{[d, u] \subseteq \mathbb{R} \mid d \leq u\}.$	$\mathbb{I}\mathbb{R} := \{[d, u] \subseteq \mathbb{R} \mid d \leq u\}.$
fong-spivak-seven-sketches_EQ0093	143	0.828	`\operatorname{Col}(\Phi)(a, b):= \begin{cases}x(a, b) & \text { if } } a, b \in X \\ \Phi(a, b) & \text { if } } a \in X, b \in y \\ \varnothing & \text { if } } a \in y, b \in X \\ y(a, b) & \text { if } } a, b \in y\end{cases}`	$\operatorname{Col}(\Phi)(a, b) := \begin{cases} x(a, b) & \text{ if } a, b \in X \\ \Phi(a, b) & \text{ if } a \in X, b \in y \\ \varnothing & \text{ if } a \in y, b \in X \\ y(a, b) & \text{ if } a, b \in y \end{cases}$	$\mathbf{Col}(\Phi)(a, b) := \begin{cases} \mathcal{X}(a, b) & \text{ if } a, b \in \mathcal{X} \\ \Phi(a, b) & \text{ if } a \in \mathcal{X}, b \in \mathcal{Y} \\ \varnothing & \text{ if } a \in \mathcal{Y}, b \in \mathcal{X} \\ \mathcal{Y}(a, b) & \text{ if } a, b \in \mathcal{Y} \end{cases}$
fong-spivak-seven-sketches_EQ0022	58	0.830	`\frac{\frac{x}{y}}{z} \quad=\quad \frac{\frac{x}{y}}{ \frac{z}{z}}`	$\frac{\frac{x}{y}}{z} \quad = \quad \frac{\frac{x}{y}}{\frac{z}{z}}$	$\frac{\frac{x}{y}}{z} \quad = \quad \frac{\frac{x}{y}}{z}$
fong-spivak-seven-sketches_EQ0146	229	0.839	`\operatorname{Circ}(\varphi): \operatorname{Circ}(2) \times \operatorname{Circ}(2) \times \operatorname{Circ}(2) \rightarrow \operatorname{Circ}(0) .`	$\operatorname{Circ}(\varphi): \operatorname{Circ}(2) \times \operatorname{Circ}(2) \times \operatorname{Circ}(2) \rightarrow \operatorname{Circ}(0).$	$\operatorname{Circ}(\varphi): \operatorname{Circ}(2) \times \operatorname{Circ}(2) \times \operatorname{Circ}(2) \rightarrow \operatorname{Circ}(0).$
fong-spivak-seven-sketches_EQ0086 (4.25)	140	0.842	`\mathrm{U}_{x}(x, y):=\mathcal{X}(x, y) .`	$\mathrm{U}_x(x, y) := \mathcal{X}(x, y).$	$\mathrm{U}_{\mathcal{X}}(x, y) := \mathcal{X}(x, y).$
fong-spivak-seven-sketches_EQ0136	219	0.843	`C:=\{\text { light }, \text { switch, battery }\} \sqcup \left\{x \Omega \mid x \in \mathbb{R}^{+}\right\} .`	$C := \{ \text{ light }, \text{ switch, battery } \} \sqcup \left\{x\Omega \mid x \in \mathbb{R}^{+}\right\}.$	$C := \{\mathtt{light}, \mathtt{switch}, \mathtt{battery}\} \sqcup \{x\Omega \mid x \in \mathbb{R}^{+}\}.$
fong-spivak-seven-sketches_EQ0125	197	0.843	`\mathcal{C}:=\stackrel{A}{\bullet} \underset{g}{ \stackrel{f}{\rightrightarrows}} \stackrel{B}{\bullet}`	$\mathcal{C} := \overset{A}{\bullet} \underset{g}{\overset{f}{\rightrightarrows}} \overset{B}{\bullet}$	$\mathcal{C} := \overset{A}{\bullet} \underset{g}{\overset{f}{\rightrightarrows}} \overset{B}{\bullet}$
fong-spivak-seven-sketches_EQ0003	24	0.849	`S:=\begin{array}{|ccc|} \hline 11 & 12 & 13 \\ \bullet & & \\ 21 & 22 & 23 \\ \bullet & \bullet & \bullet \end{array}`	$S := \begin{array}{\|ccc\|} \hline 11 & 12 & 13 \\ \bullet & & \\ 21 & 22 & 23 \\ \bullet & \bullet & \bullet \end{array}$	$S :=$ 
fong-spivak-seven-sketches_EQ0121	188	0.868	`\mathrm{B}\left(g \circ\left(h^{\mathrm{op}}\right)\right)=\{(x, y) \mid S(g)(x)=S(h)(y)\} .`	$\mathrm{B}\left(g \circ\left(h^{\mathrm{op}}\right)\right)=\{(x, y) \mid S(g)(x)=S(h)(y)\}.$	$\mathrm{B}\left(g \circ\left(h^{\mathrm{op}}\right)\right)=\{(x, y) \mid S(g)(x)=S(h)(y)\}.$

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fong-spivak-seven-sketches EQ0107	174	0.873	`\begin{array}{r} \dot{x}+3 \ddot{y}-2 z=0 \\ \ddot{y}+5 \dot{z}=0 \end{array}`	$\begin{array}{r} \dot{x}+3 \ddot{y}-2 z=0 \\ \ddot{y}+5 \dot{z}=0 \end{array}$	$\begin{array}{r} \dot{x}+3 \ddot{y}-2 z=0 \\ \ddot{y}+5 \dot{z}=0 \end{array}$
fong-spivak-seven-sketches EQ0010 (1.108)	42	0.877	`p \leq g(f(p)) \quad \text { and } \quad f(g(q)) \leq q \text {. }`	$p \leq g(f(p)) \quad \text { and } \quad f(g(q)) \leq q \text {. }$	$p \leq g(f(p)) \quad \text { and } \quad f(g(q)) \leq q \text {. }$
fong-spivak-seven-sketches EQ0079 (4.5)	132	0.881	`b \wedge c \leq d \quad \text { iff } \quad b \leq(c \Rightarrow d) .`	$b \wedge c \leq d \quad \text { iff } \quad b \leq(c \Rightarrow d) .$	$b \wedge c \leq d \quad \text { iff } \quad b \leq(c \Rightarrow d) .$
fong-spivak-seven-sketches EQ0217	296	0.890	`\begin{aligned} \lim _{\mathfrak{J}} D:=\left\{ \left(d_{1}, \ldots, d_{n}\right) \mid d_{i} \in D \left(v_{i}\right) \text { for all } 1 \leq i \leq n \right. \text { and } \& \\ \& \text { for all } \left.a: v_{i} \rightarrow v_{j} \in A, \text { we have } D(a) \left(d_{i}\right)=d_{j}\right\} . \end{aligned}`	$\begin{aligned} \lim _{\mathfrak{J}} D:=\left\{ \left(d_{1}, \ldots, d_{n}\right) \mid d_{i} \in D \left(v_{i}\right) \text { for all } 1 \leq i \leq n \right. \text { and } \& \\ \& \text { for all } \left.a: v_{i} \rightarrow v_{j} \in A, \text { we have } D(a) \left(d_{i}\right)=d_{j}\right\} . \end{aligned}$	$\begin{aligned} \lim _{\mathfrak{J}} D:=\left\{ \left(d_{1}, \ldots, d_{n}\right) \mid d_{i} \in D \left(v_{i}\right) \text { for all } 1 \leq i \leq n \right. \text { and } \& \\ \& \text { for all } \left.a: v_{i} \rightarrow v_{j} \in A, \text { we have } D(a) \left(d_{i}\right)=d_{j}\right\} . \end{aligned}$
fong-spivak-seven-sketches EQ0153 (7.18)	242	0.894	`X=\{(\text { true }, \text { true }),(\text { true }, \text { false }),(\text { false }, \text { true })\} \subseteq \mathbb{B} \times \mathbb{B} .`	$X=\{(\text { true }, \text { true }),(\text { true }, \text { false }),(\text { false }, \text { true })\} \subseteq \mathbb{B} \times \mathbb{B} .$	$X=\{(\text { true }, \text { true }),(\text { true }, \text { false }),(\text { false }, \text { true })\} \subseteq \mathbb{B} \times \mathbb{B} .$
fong-spivak-seven-sketches EQ0105	167	0.897	`a \subset \bullet>b`	$a \subset \bullet>b$	$a \subset \bullet>b$
fong-spivak-seven-sketches EQ0143 (6.95)	227	0.902	`\left(g \circ{ }_{i} f\right): X_{1} \times \cdots \times X_{i-1} \times W_{1} \times \cdots \times W_{m} \times X_{i+1} \times \cdots \times X_{n} \longrightarrow Y`	$\left(g \circ{}_{i} f\right): X_{1} \times \cdots \times X_{i-1} \times W_{1} \times \cdots \times W_{m} \times X_{i+1} \times \cdots \times X_{n} \longrightarrow Y$	$\left(g \circ{}_{i} f\right): X_{1} \times \cdots \times X_{i-1} \times W_{1} \times \cdots \times W_{m} \times X_{i+1} \times \cdots \times X_{n} \longrightarrow Y$
fong-spivak-seven-sketches EQ0129	205	0.913	`\left\{(v, d) \mid d \in D(v), \text { where } v=v_{1} \text { or } v=v_{2}\right\} .`	$\left\{(v, d) \mid d \in D(v), \text { where } v=v_{1} \text { or } v=v_{2}\right\} .$	$\left\{(v, d) \mid d \in D(v), \text { where } v=v_{1} \text { or } v=v_{2}\right\} .$
fong-spivak-seven-sketches EQ0164	257	0.917	`\stackrel{A}{\longrightarrow} \stackrel{B}{\bullet} \quad \stackrel{C}{\bullet}`	$\stackrel{A}{\longrightarrow} \stackrel{B}{\bullet} \quad \stackrel{C}{\bullet}$	$\boxed{\stackrel{A}{\bullet} \longrightarrow \stackrel{B}{\bullet} \qquad \stackrel{C}{\bullet}} \quad \subseteq \quad \left\vert \stackrel{A}{\bullet} \underset{g}{\overset{f}{\rightleftarrows}} \stackrel{B}{\bullet} \xrightarrow{h} \stackrel{C}{\bullet} \xrightarrow{i} \stackrel{D}{\bullet} \right.$
fong-spivak-seven-sketches EQ0256	315	0.919	`\begin{aligned} f(m) *_{R} f(n) & =(\underbrace{1_{R}+ \cdots+1_{R}}_{m \text { summands }}) * \underbrace{1_{R}+\cdots+1_{R}}_{n \text { summands }}) \\ & =\underbrace{1_{R} *(\underbrace{1_{R}+ \cdots+1_{R}}_{n \text { summands }})+\cdots+1_{R} *(\underbrace{1_{R}+\cdots+1_{R}}_{n \text { summands }})}_{m \text { summands }} \\ & =\underbrace{1_{R}+ \cdots+1_{R}}_{m n \text { summands }}=f(m * n) . \end{aligned}`	$\begin{aligned} f(m) *_{R} f(n) & =(\underbrace{1_{R}+ \cdots+1_{R}}_{m \text { summands }}) * \underbrace{1_{R}+\cdots+1_{R}}_{n \text { summands }}) \\ & =\underbrace{1_{R} *(\underbrace{1_{R}+ \cdots+1_{R}}_{n \text { summands }})+\cdots+1_{R} *(\underbrace{1_{R}+\cdots+1_{R}}_{n \text { summands }})}_{m \text { summands }} \\ & =\underbrace{1_{R}+ \cdots+1_{R}}_{m n \text { summands }}=f(m * n) . \end{aligned}$	$\begin{aligned} f(m) *_{R} f(n) & =(\underbrace{1_{R}+ \cdots+1_{R}}_{m \text { summands }}) * \underbrace{1_{R}+\cdots+1_{R}}_{n \text { summands }}) \\ & =\underbrace{1_{R} *(\underbrace{1_{R}+ \cdots+1_{R}}_{n \text { summands }})+\cdots+1_{R} *(\underbrace{1_{R}+\cdots+1_{R}}_{n \text { summands }})}_{m \text { summands }} \\ & =\underbrace{1_{R}+ \cdots+1_{R}}_{m n \text { summands }}=f(m * n) . \end{aligned}$
fong-spivak-seven-sketches EQ0096	149	0.919	`(f \times g) ;\left(f^{\prime} \times g^{\prime} \right)=(f ; g) \times\left(f^{\prime} ; g^{\prime} \right) .`	$(f \times g) ;\left(f^{\prime} \times g^{\prime}\right)=(f ; g) \times\left(f^{\prime} ; g^{\prime}\right) .$	$(f \times g) ;\left(f^{\prime} \times g^{\prime}\right)=(f ; g) \times\left(f^{\prime} ; g^{\prime}\right) .$

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fong-spivak-seven-sketches EQ0259	321	0.923	`\begin{aligned} \varphi_{S^{\prime}, T^{\prime}}\left(\left(\operatorname{im}_{f} \times \operatorname{im}_{g}\right)(A \times B)\right) & =\varphi_{S^{\prime}, T^{ \prime}}(\{f(a) \mid a \in A\} \times\{g(b) \mid b \in B\}) \\ & =\{(f(a), g(b)) \mid a \in A, b \in B\} \\ & =\operatorname{im}_{f \times g}(A \times B) \\ & =\operatorname{im}_{f \times g}\left(\varphi_{S, T}(A, B)\right) . \end{aligned}`	$\varphi_{S',T'}\left(\left(\operatorname{im}_f \times \operatorname{im}_g\right)(A \times B)\right) = \varphi_{S',T'}(\{f(a) \mid a \in A\} \times \{g(b) \mid b \in B\}) = \{(f(a), g(b)) \mid a \in A, b \in B\} = \operatorname{im}_{f\times g}(A \times B) = \operatorname{im}_{f\times g}\left(\varphi_{S,T}(A, B)\right).$	$\varphi_{S',T'}\left(\left(\operatorname{im}_f \times \operatorname{im}_g\right)(A \times B)\right) = \varphi_{S',T'}(\{f(a) \mid a \in A\} \times \{g(b) \mid b \in B\}) = \{(f(a), g(b)) \mid a \in A, b \in B\} = \operatorname{im}_{f\times g}(A \times B) = \operatorname{im}_{f\times g}(\varphi_{S,T}(A, B)).$
fong-spivak-seven-sketches EQ0087	140	0.928	`\mathrm{U}_{\mathcal{P}} ; \Phi=\Phi=\Phi ; \mathrm{U}_{ \mathcal{Q}}`	$\mathrm{U}_{\mathcal{P}} ; \Phi=\Phi=\Phi ; \mathrm{U}_{\mathcal{Q}}$	$\mathrm{U}_{\mathcal{P}} ; \Phi=\Phi=\Phi ; \mathrm{U}_{\mathcal{Q}}$
fong-spivak-seven-sketches EQ0199	288	0.928	`\begin{aligned} ((M * N) * P)(w, z) & =\bigvee_{y \in Y} \left(\bigvee_{x \in X} M(w, x) \otimes N(x, y)\right) \otimes P(y, z) \\ & \cong \bigvee_{y \in Y, x \in X} M(w, x) \otimes N(x, y) \otimes P(y, z) \\ & \cong \bigvee_{x \in X} M(w, x) \otimes\left(\bigvee_{y \in Y} N(x, y) \otimes P(y, z)\right) \\ & =(M *(N * P))(w, z) . \end{aligned}`	$((M * N) * P)(w, z) = \bigvee_{y \in Y} \left(\bigvee_{x \in X} M(w, x) \otimes N(x, y)\right) \otimes P(y, z) \cong \bigvee_{y \in Y, x \in X} M(w, x) \otimes N(x, y) \otimes P(y, z) \cong \bigvee_{x \in X} M(w, x) \otimes \left(\bigvee_{y \in Y} N(x, y) \otimes P(y, z)\right) = (M * (N * P))(w, z).$	$((M * N) * P)(w, z) = \bigvee_{y \in Y} \left(\bigvee_{x \in X} M(w, x) \otimes N(x, y)\right) \otimes P(y, z) \cong \bigvee_{y \in Y, x \in X} M(w, x) \otimes N(x, y) \otimes P(y, z) \cong \bigvee_{x \in X} M(w, x) \otimes \left(\bigvee_{y \in Y} N(x, y) \otimes P(y, z)\right) = (M * (N * P))(w, z).$
fong-spivak-seven-sketches EQ0251	313	0.930	`\mathrm{B}\left(g ;\left(h^{\mathrm{op}}\right)\right)= \{(x, y) \mid S(g)(x)=S(h)(y)\} .`	$\mathrm{B}\left(g ;\left(h^{\mathrm{op}}\right)\right)=\{(x, y) \mid S(g)(x)=S(h)(y)\}.$	$\mathrm{B}\left(g ;\left(h^{\mathrm{op}}\right)\right)=\{(x, y) \mid S(g)(x)=S(h)(y)\}.$
fong-spivak-seven-sketches EQ0034	73	0.932	`d_{L}(U, V):=\sup _{u \in U} \inf _{v \in V} d(u, v),`	$d_L(U, V) := \sup_{u \in U} \inf_{v \in V} d(u, v),$	$d_L(U, V) := \sup_{u \in U} \inf_{v \in V} d(u, v),$
fong-spivak-seven-sketches EQ0128	205	0.939	`\operatorname{colim}_{\mathcal{J}} D:=\{(v, d) \mid v \in V \text { and } d \in D(v)\} / \sim`	$\operatorname{colim}_{\mathcal{J}} D := \{(v, d) \mid v \in V \text{ and } d \in D(v)\} / \sim$	$\operatorname{colim}_{\mathcal{J}} D := \{(v, d) \mid v \in V \text{ and } d \in D(v)\} / \sim$
fong-spivak-seven-sketches EQ0053 (3.8)	94	0.941	`\mathbf{2}:=\operatorname{Free}\left(\begin{array}{|ccc|} \hline v_{1} & f_{1} & v_{2} \\ \bullet & & \bullet \\ \hline \end{array}\right)`	$\mathbf{2} := \operatorname{Free}\left(\begin{array}{\|ccc\|} \hline v_1 & f_1 & v_2 \\ \bullet & & \bullet \\ \hline \end{array}\right)$	$\mathbf{2} := \operatorname{Free}\left(\begin{array}{\|ccc\|} \hline v_1 & f_1 & v_2 \\ \bullet & \xrightarrow{f_1} & \bullet \\ \hline \end{array}\right)$
fong-spivak-seven-sketches EQ0075	119	0.943	`\frac{1}{\text { Em_6 }}`	*(not rendered)*	$\frac{1}{\text{Em_6}}$
fong-spivak-seven-sketches EQ0026	60	0.948	`\mathrm{H}_{2} \mathrm{O}, \quad \mathrm{NaCl}, \quad 2 \mathrm{NaOH}, \quad \mathrm{CH}_{4}+3 \mathrm{O}_{2}`	$\mathrm{H}_2\mathrm{O}, \quad \mathrm{NaCl}, \quad 2\mathrm{NaOH}, \quad \mathrm{CH}_4+3\mathrm{O}_2$	$\mathrm{H}_2\mathrm{O}, \quad \mathrm{NaCl}, \quad 2\mathrm{NaOH}, \quad \mathrm{CH}_4+3\mathrm{O}_2$
fong-spivak-seven-sketches EQ0111	176	0.950	`\left(\begin{array}{cc} A & 0 \\ 0 & B \end{array}\right)`	$\left(\begin{array}{cc} A & 0 \\ 0 & B \end{array}\right)$	$\left(\begin{array}{cc} A & 0 \\ 0 & B \end{array}\right)$
fong-spivak-seven-sketches EQ0159 (7.43)	252	0.951	`\operatorname{Sec}_{f}(U):=\{g: U \rightarrow X \mid g \text { is continuous and }(g \circ f)(u)=u \text { for all } u \in U\},`	$\operatorname{Sec}_f(U) := \{g : U \to X \mid g \text{ is continuous and } (g \circ f)(u) = u \text{ for all } u \in U\},$	$\operatorname{Sec}_f(U) := \{g : U \to X \mid g \text{ is continuous and } (g \circ f)(u) = u \text{ for all } u \in U\},$
fong-spivak-seven-sketches EQ0007	38	0.952	`f(a) \vee f(b) \not \equiv f(a \vee b) .`	$f(a) \vee f(b) \not\equiv f(a \vee b).$	$f(a) \vee f(b) \not\equiv f(a \vee b).$

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fong-spivak-seven-sketches EQ0030 (2.25)	62	0.954	`\mathrm{H}_{2} \mathrm{O}+\mathrm{NaCl} \rightarrow^{?} \mathrm{H}_{2} \mathrm{O}`	$\mathrm{H}_{2}\mathrm{O}+\mathrm{NaCl} \rightarrow^{?} \mathrm{H}_{2}\mathrm{O}$	$\mathrm{H}_{2}\mathrm{O}+\mathrm{NaCl} \rightarrow^{?} \mathrm{H}_{2}\mathrm{O}$
fong-spivak-seven-sketches EQ0194	287	0.955	`A=(A \cap \bar{B}) \cup(A \cap B) \subseteq \bar{B} \cup C .`	$A=(A \cap \bar{B}) \cup(A \cap B) \subseteq \bar{B} \cup C .$	$A=(A \cap \bar{B}) \cup(A \cap B) \subseteq \bar{B} \cup C .$
fong-spivak-seven-sketches EQ0171 (7.73)	263	0.958	`\forall(t: T) . \exists(s: S) . f(s)=t`	$\forall(t: T) . \exists(s: S) . f(s)=t$	$\forall(t: T) . \exists(s: S) . f(s)=t$
fong-spivak-seven-sketches EQ0040 (2.80)	81	0.960	`(a \otimes v) \leq w \quad \text { iff } \quad a \leq(v \multimap w) .`	$(a \otimes v) \leq w \quad \text{ iff } \quad a \leq(v \multimap w) .$	$(a \otimes v) \leq w \quad \text{ iff } \quad a \leq(v \multimap w) .$
fong-spivak-seven-sketches EQ0262	328	0.963	`\bigcup_{i \in I} A_{i}=\bigcup_{i \in I}\left(B_{i} \cap Y\right)=\left(\bigcup_{i \in i} B_{i}\right) \cap Y \in \mathbf{O p}_{? \cap Y} .`	$\bigcup_{i \in I} A_{i}=\bigcup_{i \in I}\left(B_{i} \cap Y\right)=\left(\bigcup_{i \in i} B_{i}\right) \cap Y \in \mathbf{O p}_{? \cap Y} .$	$\bigcup_{i \in I} A_{i}=\bigcup_{i \in I}\left(B_{i} \cap Y\right)=\left(\bigcup_{i \in i} B_{i}\right) \cap Y \in \mathbf{O p}_{? \cap Y} .$
fong-spivak-seven-sketches EQ0092 (4.40)	143	0.967	`\mathcal{P}(p, G(q)) \cong \mathcal{Q}(F(p), q)`	$\mathcal{P}(p, G(q)) \cong \mathcal{Q}(F(p), q)$	$\mathcal{P}(p, G(q)) \cong \mathcal{Q}(F(p), q)$
fong-spivak-seven-sketches EQ0218	297	0.967	`\lim _{\mathcal{J}} D:=\left\{\left(d_{1}, d_{2}\right) \mid d_{1} \in A \text { and } d_{2} \in B\right\} .`	$\lim_{\mathcal{J}} D:=\left\{\left(d_{1}, d_{2}\right) \mid d_{1} \in A \text{ and } d_{2} \in B\right\} .$	$\lim_{\mathcal{J}} D:=\left\{\left(d_{1}, d_{2}\right) \mid d_{1} \in A \text{ and } d_{2} \in B\right\} .$
fong-spivak-seven-sketches EQ0168	260	0.967	`s: S \mid p(s) \vdash q(s) \quad \text { or } \quad p(s) \vdash_{s: S} q(s) \text {. }`	$s: S \mid p(s) \vdash q(s) \quad \text{ or } \quad p(s) \vdash_{s: S} q(s) \text{ . }$	$s: S \mid p(s) \vdash q(s) \quad \text{ or } \quad p(s) \vdash_{s: S} q(s) \text{ . }$
fong-spivak-seven-sketches EQ0066 (3.69)	114	0.968	`f(p) \leq q \text { if and only if } p \leq g(q) .`	$f(p) \leq q \text{ if and only if } p \leq g(q) .$	$f(p) \leq q \text{ if and only if } p \leq g(q) .$
fong-spivak-seven-sketches EQ0119 (5.78)	187	0.969	`B_{1} ; B_{2}:=\left\{(x, z) \mid \text { there exists } y \in R^{n} \text { such that }(x, y) \in B_{1} \text { and }(y, z) \in B_{2}\right\} .`	$B_{1} ; B_{2}:=\left\{(x, z) \mid \text{ there exists } y \in R^{n} \text{ such that } (x, y) \in B_{1} \text{ and } (y, z) \in B_{2}\right\} .$	$B_{1} ; B_{2}:=\left\{(x, z) \mid \text{ there exists } y \in R^{n} \text{ such that } (x, y) \in B_{1} \text{ and } (y, z) \in B_{2}\right\} .$
fong-spivak-seven-sketches EQ0157	249	0.969	`\left.s_{i}\right|_{U_{i} \cap U_{j}}=\left.s_{j} \right|_{U_{i} \cap U_{j}} .`	$s_{i}\left\|_{U_{i} \cap U_{j}}=s_{j}\right\|_{U_{i} \cap U_{j}} .$	$s_{i}\left\|_{U_{i} \cap U_{j}}=s_{j}\right\|_{U_{i} \cap U_{j}} .$
fong-spivak-seven-sketches EQ0100	157	0.973	`\eta_{x}: \mathbf{1} \times \mathcal{X}^{\mathrm{op}} \times \mathcal{X} \rightarrow \mathcal{V} ;`	$\eta_{x}: \mathbf{1} \times \mathcal{X}^{\mathrm{op}} \times \mathcal{X} \rightarrow \mathcal{V} ;$	$\eta_{x}: \mathbf{1} \times \mathcal{X}^{\mathrm{op}} \times \mathcal{X} \rightarrow \mathcal{V} ;$
fong-spivak-seven-sketches EQ0045	85	0.974	`d(U, V):=\sup _{u \in U} \inf _{v \in V} d(u, v) \quad X(U, V):=\bigwedge_{u \in U} \bigvee_{v \in V} x(u, v) .`	$d(U, V):=\sup_{u \in U} \inf_{v \in V} d(u, v) \quad X(U, V):=\bigwedge_{u \in U} \bigvee_{v \in V} x(u, v) .$	$d(U, V):=\sup_{u \in U} \inf_{v \in V} d(u, v) \quad X(U, V):=\bigwedge_{u \in U} \bigvee_{v \in V} x(u, v) .$
fong-spivak-seven-sketches EQ0046	85	0.974	`v \rightarrow w:=\bigvee_{\{a \in V \mid a \otimes v \leq w\}} a .`	$v \rightarrow w:=\bigvee_{\{a \in V \mid a \otimes v \leq w\}} a .$	$v \rightarrow w:=\bigvee_{\{a \in V \mid a \otimes v \leq w\}} a .$
fong-spivak-seven-sketches EQ0085	139	0.976	`(\Phi ; \Psi)(p, r)=\bigvee_{q \in Q}(\Phi(p, q) \otimes \Psi(q, r)) .`	$(\Phi ; \Psi)(p, r)=\bigvee_{q \in Q}(\Phi(p, q) \otimes \Psi(q, r)) .$	$(\Phi ; \Psi)(p, r)=\bigvee_{q \in Q}(\Phi(p, q) \otimes \Psi(q, r)) .$
fong-spivak-seven-sketches EQ0195	287	0.979	`A \cap B \subseteq(\bar{B} \cup C) \cap B=(\bar{B} \cap B) \cup(C \cap B)=C \cap B \subseteq C .`	$A \cap B \subseteq(\bar{B} \cup C) \cap B=(\bar{B} \cap B) \cup(C \cap B)=C \cap B \subseteq C .$	$A \cap B \subseteq(\bar{B} \cup C) \cap B=(\bar{B} \cap B) \cup(C \cap B)=C \cap B \subseteq C .$
fong-spivak-seven-sketches EQ0173	265	0.979	`\mathbb{R} \cong\{[d, u] \in \mathbb{I} \mathbb{R} \mid d=u\} .`	$\mathbb{R} \cong\{[d, u] \in \mathbb{I} \mathbb{R} \mid d=u\} .$	$\mathbb{R} \cong\{[d, u] \in \mathbb{I} \mathbb{R} \mid d=u\} .$
fong-spivak-seven-sketches EQ0137	220	0.982	`\text { Circ: }(\text { FinSet },+) \longrightarrow(\text { Set }, \times)`	$\text{ Circ: }(\text{ FinSet }, +) \longrightarrow(\text{ Set }, \times)$	$\text{ Circ: }(\text{ FinSet }, +) \longrightarrow(\text{ Set }, \times)$
fong-spivak-seven-sketches EQ0169	260	0.983	`\forall(t: T) . p(s, t) .`	$\forall(t: T) . p(s, t) .$	$\forall(t: T) . p(s, t) .$
fong-spivak-seven-sketches EQ0018	46	0.985	`\operatorname{fix}_{j}:=\{p \in P \mid j(p) \cong p\} .`	$\operatorname{fix}_{j}:=\{p \in P \mid j(p) \cong p\} .$	$\operatorname{fix}_{j}:=\{p \in P \mid j(p) \cong p\} .$

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fong-spivak-seven-sketches EQ0103	165	0.985	`\iota^{\prime \prime}(x)= \begin{cases}\iota(x) & \text { if } \iota(x) \in I \\ \iota^{\prime}(\iota(x)) & \text { if } \iota(x) \in \underline{n} \\ \iota^{\prime}(x) & \text { if } x \in O .^{\prime}\end{cases}`	$\iota''(x) = \begin{cases}\iota(x) & \text{ if } \iota(x) \in I \\ \iota'(\iota(x)) & \text{ if } \iota(x) \in \underline{n} \\ \iota'(x) & \text{ if } x \in O.'\end{cases}$	$\iota''(x) = \begin{cases}\iota(x) & \text{ if } \iota(x) \in I \\ \iota'(\iota(x)) & \text{ if } \iota(x) \in \underline{n} \\ \iota'(x) & \text{ if } x \in O.'\end{cases}$
fong-spivak-seven-sketches EQ0210	292	0.986	`F(a):=a^{\prime}, \quad G(a):=a^{\prime}, \quad F(b):=b^{\prime}, \quad G(b):=b^{\prime}, \quad F(f):=f_{1}, \text { and } G(f):=f_{2} .`	$F(a) := a', \quad G(a) := a', \quad F(b) := b', \quad G(b) := b', \quad F(f) := f_1,$ and $G(f) := f_2.$	$F(a) := a', \quad G(a) := a', \quad F(b) := b', \quad G(b) := b', \quad F(f) := f_1,$ and $G(f) := f_2.$
fong-spivak-seven-sketches EQ0117 (5.75)	186	0.988	`\mathrm{B}(g)=\left\{(x, S(g)(x)) \mid x \in R^{m}\right \} \subseteq R^{m} \times R^{n} .`	$\mathrm{B}(g) = \{(x, S(g)(x)) \mid x \in R^m\} \subseteq R^m \times R^n.$	$\mathrm{B}(g) = \left\{\left(x, S(g)(x)\right) \mid x \in R^m\right\} \subseteq R^m \times R^n.$
fong-spivak-seven-sketches EQ0031	67	0.989	`\text { Cost }:=([0, \infty], \geq, 0,+),`	$\text{Cost } := ([0, \infty], \geq, 0, +),$	$\textbf{Cost} := ([0, \infty], \geq, 0, +),$
fong-spivak-seven-sketches EQ0204	289	0.989	`\stackrel{v_{1}}{\bullet} \xrightarrow{f_{1}} \stackrel{v_{2}}{\bullet} \xrightarrow{f_{2}} \cdots \xrightarrow{f_{n-1}} \stackrel{v_{n}}{\bullet}`	$\overset{v_1}{\bullet} \xrightarrow{f_1} \overset{v_2}{\bullet} \xrightarrow{f_2} \cdots \xrightarrow{f_{n-1}} \overset{v_n}{\bullet}$	$\overset{v_1}{\bullet} \xrightarrow{f_1} \overset{v_2}{\bullet} \xrightarrow{f_2} \cdots \xrightarrow{f_{n-1}} \overset{v_n}{\bullet}$
fong-spivak-seven-sketches EQ0213	294	0.989	`G:=\stackrel{1}{\bullet} \xrightarrow{a} \stackrel{2}{ \bullet} \xrightarrow{b} \stackrel{3}{\bullet}`	$G := \overset{1}{\bullet} \xrightarrow{a} \overset{2}{\bullet} \xrightarrow{b} \overset{3}{\bullet}$	$G := \overset{1}{\bullet} \xrightarrow{a} \overset{2}{\bullet} \xrightarrow{b} \overset{3}{\bullet}$
fong-spivak-seven-sketches EQ0250	313	0.990	`\left\{(x, y) \mid \text { there exists } z \in R^{n} \text { such that } S(g)(x)=z \text { and } z=S(h)(y) \right\} .`	$\{(x, y) \mid \text{ there exists } z \in R^n \text{ such that } S(g)(x) = z \text{ and } z = S(h)(y)\}.$	$\{(x, y) \mid \text{ there exists } z \in R^n \text{ such that } S(g)(x) = z \text{ and } z = S(h)(y)\}.$
fong-spivak-seven-sketches EQ0038	78	0.990	`\mathcal{X}\left(x_{1}, x_{2}\right) \leq y\left(F \left(x_{1}\right), F\left(x_{2}\right)\right),`	$\mathcal{X}\left(x_1, x_2\right) \leq y\left(F\left(x_1\right), F\left(x_2\right)\right),$	$\mathcal{X}(x_1, x_2) \leq \mathcal{Y}(F(x_1), F(x_2)),$
fong-spivak-seven-sketches EQ0102	162	0.991	`R ; S:=\{(i, k) \in \underline{m} \times \underline{p} \mid \exists(j \in \underline{n}) .(i, j) \in R \text { and }(j, k) \in S\} .`	$R; S := \{(i, k) \in \underline{m} \times \underline{p} \mid \exists(j \in \underline{n}).(i, j) \in R \text{ and } (j, k) \in S\}.$	$R \fatsemi S := \{(i, k) \in \underline{m} \times \underline{p} \mid \exists(j \in \underline{n}).(i, j) \in R \text{ and } (j, k) \in S\}.$
fong-spivak-seven-sketches EQ0080 (4.6)	133	0.991	`\Phi: x^{\mathrm{op}} \times y \rightarrow \mathcal{V} .`	$\Phi : x^{\mathrm{op}} \times y \to \mathcal{V}.$	$\Phi\colon \mathcal{X}^{\mathrm{op}} \times \mathcal{Y} \to \mathcal{V}.$
fong-spivak-seven-sketches EQ0134	216	0.992	`\varphi_{c_{1}, c_{2}}: F\left(c_{1}\right) \otimes_{ \mathcal{D}} F\left(c_{2}\right) \rightarrow F\left(c_{1} \otimes_{\mathcal{C}} c_{2}\right),`	$\varphi_{c_1, c_2} : F\left(c_1\right) \otimes_{\mathcal{D}} F\left(c_2\right) \to F\left(c_1 \otimes_{\mathcal{C}} c_2\right),$	$\varphi_{c_1, c_2}\colon F(c_1) \otimes_{\mathcal{D}} F(c_2) \to F(c_1 \otimes_{\mathcal{C}} c_2),$
fong-spivak-seven-sketches EQ0148	236	0.992	`\{p \in P \mid \text { likes_cats }(p)\} .`	*(not rendered)*	$\{p \in P \mid \texttt{likes_cats}(p)\}.$
fong-spivak-seven-sketches EQ0144	228	0.992	`(f \circ i g):=f \circ(\mathrm{id}, \ldots, \mathrm{id}, g, \mathrm{id}, \ldots, \mathrm{id})`	$(f \circ i g) := f \circ (\mathrm{id}, \ldots, \mathrm{id}, g, \mathrm{id}, \ldots, \mathrm{id})$	$(f \circ_i g) := f \circ (\mathrm{id}, \ldots, \mathrm{id}, g, \mathrm{id}, \ldots, \mathrm{id})$
fong-spivak-seven-sketches EQ0123 (5.86)	189	0.993	`\{(0,(x, x)) \mid x \in R\} \subseteq R^{0} \times R^{2} \quad \text { and } \quad\{((x, x), 0) \mid x \in R\} \subseteq R^{2} \times R^{0} .`	$\{(0,(x, x)) \mid x \in R\} \subseteq R^0 \times R^2 \quad \text{and} \quad \{((x, x), 0) \mid x \in R\} \subseteq R^2 \times R^0.$	$\{(0,(x, x)) \mid x \in R\} \subseteq R^0 \times R^2 \quad \text{and} \quad \{((x, x), 0) \mid x \in R\} \subseteq R^2 \times R^0.$
fong-spivak-seven-sketches EQ0229	304	0.993	`x \xrightarrow{\alpha^{-1}} x \times \mathbf{1} \xrightarrow{\mathrm{U}_{x} \times \eta_{x}} x \times x^{\mathrm{op}} \times x \xrightarrow{\epsilon_{x} \times \mathrm{U}_{x}} \mathbf{1} \times x \xrightarrow{\alpha} x`	$x \xrightarrow{\alpha^{-1}} x \times \mathbf{1} \xrightarrow{\mathrm{U}_x \times \eta_x} x \times x^{\mathrm{op}} \times x \xrightarrow{\epsilon_x \times \mathrm{U}_x} \mathbf{1} \times x \xrightarrow{\alpha} x$	$\mathcal{X} \xrightarrow{\alpha^{-1}} \mathcal{X} \times \mathbf{1} \xrightarrow{\mathrm{U}_{\mathcal{X}} \times \eta_{\mathcal{X}}} \mathcal{X} \times \mathcal{X}^{\mathrm{op}} \times \mathcal{X} \xrightarrow{\epsilon_{\mathcal{X}} \times \mathrm{U}_{\mathcal{X}}} \mathbf{1} \times \mathcal{X} \xrightarrow{\alpha} \mathcal{X}$

Identifier	Page	Conf.	LaTeX source	Rendered	Image
fong-spivak-seven-sketches_EQ0225	301	0.993	`\begin{aligned} ((\Phi ; \Psi) ; \Upsilon)(p, s) & =\bigvee_{r \in \mathcal{R}}\left(\bigvee_{q \in \mathcal{Q}} \Phi(p, q) \otimes \Psi(q, r)\right) \otimes \Upsilon(r, s) \\ & =\bigvee_{r \in \mathcal{R}, q \in \mathcal{Q}} \Phi(p, q) \otimes \Psi(q, r) \otimes \Upsilon(r, s) \\ & =\bigvee_{q \in \mathcal{Q}} \Phi(p, q) \otimes \bigvee_{r \in \mathcal{R}}(\Psi(q, r) \otimes \Upsilon(r, s)) \\ & =(\Phi ;(\Psi ; \Upsilon))(p, s) \end{aligned}`	$$\begin{aligned} ((\Phi ; \Psi) ; \Upsilon)(p, s) & =\bigvee_{r \in \mathcal{R}}\left(\bigvee_{q \in \mathcal{Q}} \Phi(p, q) \otimes \Psi(q, r)\right) \otimes \Upsilon(r, s) \\ & =\bigvee_{r \in \mathcal{R}, q \in \mathcal{Q}} \Phi(p, q) \otimes \Psi(q, r) \otimes \Upsilon(r, s) \\ & =\bigvee_{q \in \mathcal{Q}} \Phi(p, q) \otimes \bigvee_{r \in \mathcal{R}}(\Psi(q, r) \otimes \Upsilon(r, s)) \\ & =(\Phi ;(\Psi ; \Upsilon))(p, s) \end{aligned}$$	$$\begin{aligned} ((\Phi ; \Psi) ; \Upsilon)(p, s) & =\bigvee_{r \in \mathcal{R}}\left(\bigvee_{q \in \mathcal{Q}} \Phi(p, q) \otimes \Psi(q, r)\right) \otimes \Upsilon(r, s) \\ & =\bigvee_{r \in \mathcal{R}, q \in \mathcal{Q}} \Phi(p, q) \otimes \Psi(q, r) \otimes \Upsilon(r, s) \\ & =\bigvee_{q \in \mathcal{Q}} \Phi(p, q) \otimes \bigvee_{r \in \mathcal{R}}\left(\Psi(q, r) \otimes \Upsilon(r, s)\right) \\ & =(\Phi ;(\Psi ; \Upsilon))(p, s) \end{aligned}$$
fong-spivak-seven-sketches_EQ0089 (4.29)	140	0.994	`\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right)=\mathcal{P}\left(p, p_{1}\right) \otimes \Phi \left(p_{1}, q\right) \otimes I \leq \mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right) \otimes \mathcal{Q}(q, q) \leq \Phi(p, q) .`	$\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right)=\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right) \otimes I \leq \mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right) \otimes \mathcal{Q}(q, q) \leq \Phi(p, q) .$	$\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right)=\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right) \otimes I \leq \mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right) \otimes \mathcal{Q}(q, q) \leq \Phi(p, q) .$
fong-spivak-seven-sketches_EQ0165 (7.56)	257	0.995	`(U \wedge V):=U \cap V \quad \text { and } \quad(U \vee V):=U \cup V .`	$(U \wedge V):=U \cap V \quad \text { and } \quad(U \vee V):=U \cup V .$	$(U \wedge V):=U \cap V \quad \text { and } \quad(U \vee V):=U \cup V .$
fong-spivak-seven-sketches_EQ0150 (7.14)	241	0.995	`\Omega_{\text {Set }}:=\mathbb{B}=\{\text { true }, \text { false }\} .`	$\Omega_{\text {Set }}:=\mathbb{B}=\{\text { true }, \text { false }\} .$	$\Omega_{\text {Set }}:=\mathbb{B}=\{\text { true }, \text { false }\} .$
fong-spivak-seven-sketches_EQ0160 (7.50)	255	0.996	`\Omega(U):=\left\{U^{\prime} \in \mathbf{O p} \mid U^{ \prime} \subseteq U\right\} .`	$\Omega(U):=\left\{U^{\prime} \in \mathbf{O p} \mid U^{ \prime} \subseteq U\right\} .$	$\Omega(U):=\left\{U^{\prime} \in \mathbf{O p} \mid U^{ \prime} \subseteq U\right\} .$
fong-spivak-seven-sketches_EQ0260	324	0.996	`p ; h_{3}=r ; g ; h_{3}=r ; h_{2} ; g^{\prime}=q ; f^{ \prime} ; g^{\prime}`	$p ; h_{3}=r ; g ; h_{3}=r ; h_{2} ; g^{\prime}=q ; f^{\prime} ; g^{\prime}$	$p ; h_{3}=r ; g ; h_{3}=r ; h_{2} ; g^{\prime}=q ; f^{\prime} ; g^{\prime}$
fong-spivak-seven-sketches_EQ0088 (4.28)	140	0.996	`\Phi(p, q)=I \otimes \Phi(p, q) \leq \mathcal{P}(p, p) \otimes \Phi(p, q) \leq \bigvee_{p_{1} \in P}\left( \mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right)\right)=\left(\mathrm{U}_{\mathcal{P}} ; \Phi \right)(p, q) .`	$\Phi(p, q)=I \otimes \Phi(p, q) \leq \mathcal{P}(p, p) \otimes \Phi(p, q) \leq \bigvee_{p_{1} \in P}\left(\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right)\right)=\left(\mathrm{U}_{\mathcal{P}} ; \Phi\right)(p, q) .$	$\Phi(p, q)=I \otimes \Phi(p, q) \leq \mathcal{P}(p, p) \otimes \Phi(p, q) \leq \bigvee_{p_{1} \in P}\left(\mathcal{P}\left(p, p_{1}\right) \otimes \Phi\left(p_{1}, q\right)\right)=\left(\mathrm{U}_{\mathcal{P}} ; \Phi\right)(p, q) .$
fong-spivak-seven-sketches_EQ0185	276	0.996	`f^{*}(P)=\{\{x \in \mathbb{Z} \mid x \leq 0\},\{x \in \mathbb{Z} \mid x \geq 1\}\} \quad \text { and } \quad f^{*}(Q)=\{\{0\},\{x \in \mathbb{Z} \mid x \neq 0\}\} .`	$f^{*}(P)=\{\{x \in \mathbb{Z} \mid x \leq 0\},\{x \in \mathbb{Z} \mid x \geq 1\}\} \quad \text { and } \quad f^{*}(Q)=\{\{0\},\{x \in \mathbb{Z} \mid x \neq 0\}\} .$	$f^{*}(P)=\{\{x \in \mathbb{Z} \mid x \leq 0\},\{x \in \mathbb{Z} \mid x \geq 1\}\} \quad \text { and } \quad f^{*}(Q)=\{\{0\},\{x \in \mathbb{Z} \mid x \neq 0\}\} .$
fong-spivak-seven-sketches_EQ0166 (7.57)	257	0.996	`(U \Rightarrow V):=\bigcup_{\{R \in \mathbf{O} \mathbf{p} \mid R \cap U \subseteq V\}} R .`	$(U \Rightarrow V):=\bigcup_{\{R \in \mathbf{O p} \mid R \cap U \subseteq V\}} R .$	$(U \Rightarrow V):=\bigcup_{\{R \in \mathbf{O p} \mid R \cap U \subseteq V\}} R .$
fong-spivak-seven-sketches_EQ0013 (1.116)	44	0.997	`f(p):=\bigwedge\{q \in Q \mid p \leq g(q)\} ;`	$f(p):=\bigwedge\{q \in Q \mid p \leq g(q)\} ;$	$f(p):=\bigwedge\{q \in Q \mid p \leq g(q)\} ;$
fong-spivak-seven-sketches_EQ0154	243	0.997	`\begin{array}{cc||c|c} P & Q & P \wedge Q & P=(P \wedge Q) \\ \text { true } & \text { true } & ? & ? \\ \text { true } & \text { false } & ? & ? \\ \text { false } & \text { true } & ? & ? \\ \text { false } & \text { false } & ? & ? \end{array}`	$\begin{array}{cc\|\|c\|c} P & Q & P \wedge Q & P=(P \wedge Q) \\ \text { true } & \text { true } & ? & ? \\ \text { true } & \text { false } & ? & ? \\ \text { false } & \text { true } & ? & ? \\ \text { false } & \text { false } & ? & ? \end{array}$	$\begin{array}{cc\|\|c\|c} P & Q & P \wedge Q & P=(P \wedge Q) \\ \text { true } & \text { true } & ? & ? \\ \text { true } & \text { false } & ? & ? \\ \text { false } & \text { true } & ? & ? \\ \text { false } & \text { false } & ? & ? \end{array}$

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fong-spivak-seven-sketches EQ0041	81	0.998	a+x \geq y \quad \text { iff } \quad a \geq y-x \quad \text { iff } \quad \max (0, a) \geq \max (0, y-x) \quad \text { iff } \quad a \geq(x \multimap y)	$a+x \geq y \quad \text{ iff } \quad a \geq y-x \quad \text{ iff } \quad \max(0, a) \geq \max(0, y-x) \quad \text{ iff } \quad a \geq(x \multimap y)$	$a+x \geq y \quad \text{ iff } \quad a \geq y-x \quad \text{ iff } \quad \max(0, a) \geq \max(0, y-x) \quad \text{ iff } \quad a \geq(x \multimap y)$
fong-spivak-seven-sketches EQ0082 (4.14)	135	0.998	\Phi(B, x)=11, \quad \Phi(A, z)=20, \quad \Phi(C, y)=17 .	$\Phi(B, x)=11, \quad \Phi(A, z)=20, \quad \Phi(C, y)=17.$	$\Phi(B, x)=11, \quad \Phi(A, z)=20, \quad \Phi(C, y)=17.$
fong-spivak-seven-sketches EQ0124	190	0.998	v=\int \frac{1}{m} F(t) d t+u(t)+p \int a u(t)+b v(t) d t .	$v=\int \frac{1}{m} F(t) d t+u(t)+p \int a u(t)+b v(t) d t.$	$v=\int \frac{1}{m} F(t) d t+u(t)+p \int a u(t)+b v(t) d t.$
fong-spivak-seven-sketches EQ0198	288	0.998	\begin{aligned} I_{X} * M(x, y) & =\bigvee_{x^{\prime} \in X} I_{X}\left(x, x^{\prime}\right) \otimes M\left(x^{\prime}, y\right) \\ & =\left(I_{X}(x, x) \otimes M(x, y)\right) \vee\left(\bigvee_{x^{\prime} \in X, x^{\prime} \neq x} I_{X}\left(x, x^{\prime}\right) \otimes M\left(x^{\prime}, y\right)\right) \\ & =(I \otimes M(x, y)) \vee\left(\bigvee_{x^{\prime} \in X, x^{\prime} \neq x} 0 \otimes M\left(x^{\prime}, y\right)\right) \\ & =M(x, y) \vee 0=M(x, y) . \end{aligned}	$\begin{aligned} I_{X} * M(x, y) & =\bigvee_{x^{\prime} \in X} I_{X}\left(x, x^{\prime}\right) \otimes M\left(x^{\prime}, y\right) \\ & =\left(I_{X}(x, x) \otimes M(x, y)\right) \vee\left(\bigvee_{x^{\prime} \in X, x^{\prime} \neq x} I_{X}\left(x, x^{\prime}\right) \otimes M\left(x^{\prime}, y\right)\right) \\ & =(I \otimes M(x, y)) \vee\left(\bigvee_{x^{\prime} \in X, x^{\prime} \neq x} 0 \otimes M\left(x^{\prime}, y\right)\right) \\ & =M(x, y) \vee 0=M(x, y). \end{aligned}$	$\begin{aligned} I_{X} * M(x, y) & =\bigvee_{x^{\prime} \in X} I_{X}\left(x, x^{\prime}\right) \otimes M\left(x^{\prime}, y\right) \\ & =\left(I_{X}(x, x) \otimes M(x, y)\right) \vee\left(\bigvee_{x^{\prime} \in X, x^{\prime} \neq x} I_{X}\left(x, x^{\prime}\right) \otimes M\left(x^{\prime}, y\right)\right) \\ & =(I \otimes M(x, y)) \vee\left(\bigvee_{x^{\prime} \in X, x^{\prime} \neq x} 0 \otimes M\left(x^{\prime}, y\right)\right) \\ & =M(x, y) \vee 0=M(x, y). \end{aligned}$
fong-spivak-seven-sketches EQ0070	117	0.999	\Sigma_{F}(I)(\text { Airline Seat })=I(\text { Economy }) \sqcup I(\text { First Class }) .	$\Sigma_{F}(I)(\text{ Airline Seat })=I(\text{ Economy }) \sqcup I(\text{ First Class }).$	$\Sigma_{F}(I)(\text{Airline Seat})=I(\text{Economy}) \sqcup I(\text{First Class}).$
fong-spivak-seven-sketches EQ0084 (4.20)	138	0.999	(\Phi ; \Psi)(p, r):=\bigvee_{q \in Q} \Phi(p, q) \wedge \Psi(q, r) .	$(\Phi ; \Psi)(p, r):=\bigvee_{q \in Q} \Phi(p, q) \wedge \Psi(q, r).$	$(\Phi ; \Psi)(p, r):=\bigvee_{q \in Q} \Phi(p, q) \wedge \Psi(q, r).$
fong-spivak-seven-sketches EQ0008 (1.96)	39	0.999	f(p) \leq q \quad \text { if and only if } \quad p \leq g(q) .	$f(p) \leq q \quad \text{ if and only if } \quad p \leq g(q).$	$f(p) \leq q \quad \text{ if and only if } \quad p \leq g(q).$
fong-spivak-seven-sketches EQ0035	76	0.999	\begin{array}{rlr} I_{W} & \leq f\left(I_{V}\right) & \\ & \leq f(\mathcal{C}(c, c)) & \\ & =\mathcal{C}_{f}(c, c) & \end{array}	$\begin{array}{rlr} I_{W} & \leq f\left(I_{V}\right) & (f \text{ is monoidal monotone }) \\ & \leq f(\mathcal{C}(c, c)) & (\mathcal{C} \text{ is } \mathcal{V}\text{-category }) \\ & =\mathcal{C}_{f}(c, c) & (\text{ definition of } \mathcal{C}_{f}) \end{array}$	$\begin{array}{rlr} I_{W} & \leq f\left(I_{V}\right) & (f \text{ is monoidal monotone}) \\ & \leq f(\mathcal{C}(c, c)) & (\mathcal{C} \text{ is } \mathcal{V}\text{-category}) \\ & =\mathcal{C}_{f}(c, c) & (\text{definition of } \mathcal{C}_{f}) \end{array}$
fong-spivak-seven-sketches EQ0042	82	0.999	a+c \rightarrow d \quad \text { if and only if } \quad a \rightarrow(c \rightarrow d) .	$a+c \rightarrow d \quad \text{ if and only if } \quad a \rightarrow(c \rightarrow d).$	$a+c \rightarrow d \quad \text{ if and only if } \quad a \rightarrow(c \rightarrow d).$
fong-spivak-seven-sketches EQ0065 (3.66)	113	0.999	\text { Gr } \xrightarrow{F} \text { DDS } \xrightarrow{I} \text { Set. }	$\text{ Gr } \xrightarrow{F} \text{ DDS } \xrightarrow{I} \text{ Set.}$	$\mathbf{Gr} \xrightarrow{F} \mathbf{DDS} \xrightarrow{I} \mathbf{Set}.$
fong-spivak-seven-sketches EQ0126 (6.15)	199	0.999	[f, g](x)= \begin{cases}f(x) & \text { if } x= \iota_{A}(a) \text { for some } a \in A ; \\ g(x) & \text { if } x=\iota_{B}(b) \text { for some } b \in B . \end{cases}	$[f, g](x)=\begin{cases}f(x) & \text{ if } x= \iota_{A}(a) \text{ for some } a \in A; \\ g(x) & \text{ if } x=\iota_{B}(b) \text{ for some } b \in B.\end{cases}$	$[f, g](x)=\begin{cases}f(x) & \text{ if } x= \iota_{A}(a) \text{ for some } a \in A; \\ g(x) & \text{ if } x=\iota_{B}(b) \text{ for some } b \in B.\end{cases}$

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fong-spivak-seven-sketches_EQ0139	220	0.999	`\begin{aligned} \operatorname{Circ}(f): \operatorname{Circ}(V) & \longrightarrow \operatorname{Circ}\left(V^{\prime}\right) ; \\ (V, A, s, t, \ell) & \longmapsto\left(V^{\prime}, A,(s ; f),(t ; f), \ell\right) . \end{aligned}`	$\begin{aligned} \operatorname{Circ}(f): \operatorname{Circ}(V) & \longrightarrow \operatorname{Circ}\left(V^{\prime}\right) ; \\ (V, A, s, t, \ell) & \longmapsto\left(V^{\prime}, A,(s ; f),(t ; f), \ell\right) . \end{aligned}$	$\begin{aligned} \operatorname{Circ}(f): \operatorname{Circ}(V) & \longrightarrow \operatorname{Circ}\left(V^{\prime}\right) ; \\ (V, A, s, t, \ell) & \longmapsto\left(V^{\prime}, A,(s ; f),(t ; f), \ell\right) . \end{aligned}$
fong-spivak-seven-sketches_EQ0032	68	1.000	`d(x):=\left\{\begin{array}{ll} \text { false } & \text { if } x>0 \\ \text { true } & \text { if } x=0 \end{array} \quad u(x):= \begin{cases}\text { false } & \text { if } x=\infty \\ \text { true } & \text { if } x<\infty \end{cases}\right.`	$d(x):=\left\{\begin{array}{ll} \text { false } & \text { if } x>0 \\ \text { true } & \text { if } x=0 \end{array} \quad u(x):= \begin{cases}\text { false } & \text { if } x=\infty \\ \text { true } & \text { if } x<\infty \end{cases}\right.$	$d(x):=\left\{\begin{array}{ll} \text { false } & \text { if } x>0 \\ \text { true } & \text { if } x=0 \end{array} \quad u(x):= \begin{cases}\text { false } & \text { if } x=\infty \\ \text { true } & \text { if } x<\infty \end{cases}\right.$
fong-spivak-seven-sketches_EQ0176	272	1.000	`\varnothing, \quad\{1\}, \quad\{2\}, \quad\{3\}, \quad \{1,2\}, \quad\{1,3\}, \quad\{2,3\}, \quad\{1,2,3\} .`	$\varnothing, \quad\{1\}, \quad\{2\}, \quad\{3\}, \quad\{1,2\}, \quad\{1,3\}, \quad\{2,3\}, \quad\{1,2,3\} .$	$\varnothing, \quad\{1\}, \quad\{2\}, \quad\{3\}, \quad\{1,2\}, \quad\{1,3\}, \quad\{2,3\}, \quad\{1,2,3\} .$
fong-spivak-seven-sketches_EQ0252	313	1.000	`\begin{aligned} \mathrm{B}\left(g^{\mathrm{op}}\right) & =\left\{(y, x) \in R^{n} \times R^{m} \mid y=S(g)(x) \right\} \\ \mathrm{B}(h) & =\left\{(x, z) \in R^{m} \times R^{p} \mid S(h)(x)=z\right\} \end{aligned}`	$\begin{aligned} \mathrm{B}\left(g^{\mathrm{op}}\right) & =\left\{(y, x) \in R^{n} \times R^{m} \mid y=S(g)(x) \right\} \\ \mathrm{B}(h) & =\left\{(x, z) \in R^{m} \times R^{p} \mid S(h)(x)=z\right\} \end{aligned}$	$\begin{aligned} \mathrm{B}\left(g^{\mathrm{op}}\right) & =\left\{(y, x) \in R^{n} \times R^{m} \mid y=S(g)(x) \right\} \\ \mathrm{B}(h) & =\left\{(x, z) \in R^{m} \times R^{p} \mid S(h)(x)=z\right\} \end{aligned}$
fong-spivak-seven-sketches_EQ0001 (1.8)	18	1.000	`\Phi(A) \vee \Phi(B) \leq \Phi(A \vee B) .`	$\Phi(A) \vee \Phi(B) \leq \Phi(A \vee B) .$	$\Phi(A) \vee \Phi(B) \leq \Phi(A \vee B) .$
fong-spivak-seven-sketches_EQ0004	24	1.000	`f(11)=a, \quad f(12)=a, \quad f(13)=b, \quad f(21)=c, \quad f(22)=d, \quad f(23)=d`	$f(11)=a, \quad f(12)=a, \quad f(13)=b, \quad f(21)=c, \quad f(22)=d, \quad f(23)=d$	$f(11)=a, \quad f(12)=a, \quad f(13)=b, \quad f(21)=c, \quad f(22)=d, \quad f(23)=d$
fong-spivak-seven-sketches_EQ0006	35	1.000	`\left\{\left.\frac{1}{n+1} \right\rvert\, n \in \mathbb{N}\right\}=\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\right\} \subseteq \mathbb{R}`	$\left\{\left.\frac{1}{n+1} \right\rvert\, n \in \mathbb{N}\right\}=\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\right\} \subseteq \mathbb{R}$	$\left\{\left.\frac{1}{n+1} \right\rvert\, n \in \mathbb{N}\right\}=\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\right\} \subseteq \mathbb{R}$
fong-spivak-seven-sketches_EQ0009	39	1.000	`\lceil x / 3\rceil \leq y \text { if and only if } x \leq 3 y .`	$\lceil x / 3\rceil \leq y \text { if and only if } x \leq 3 y .$	$\lceil x / 3\rceil \leq y \text { if and only if } x \leq 3 y .$
fong-spivak-seven-sketches_EQ0011	43	1.000	`g(\bigwedge A) \cong \bigwedge g(A) .`	$g(\bigwedge A) \cong \bigwedge g(A) .$	$g(\bigwedge A) \cong \bigwedge g(A) .$
fong-spivak-seven-sketches_EQ0012	43	1.000	`f(\bigvee A) \cong \bigvee f(A)`	$f(\bigvee A) \cong \bigvee f(A)$	$f(\bigvee A) \cong \bigvee f(A)$
fong-spivak-seven-sketches_EQ0014	44	1.000	`p_{0} \leq \bigwedge\left\{g(q) \in P \mid p_{0} \leq g(q)\right\} \cong g\left(\bigwedge\left\{q \in Q \mid p_{0} \leq g(q)\right\}\right)=g\left(f\left(p_{0}\right) \right),`	$p_{0} \leq \bigwedge\left\{g(q) \in P \mid p_{0} \leq g(q)\right\} \cong g\left(\bigwedge\left\{q \in Q \mid p_{0} \leq g(q)\right\}\right)=g\left(f\left(p_{0}\right) \right),$	$p_{0} \leq \bigwedge\left\{g(q) \in P \mid p_{0} \leq g(q)\right\} \cong g\left(\bigwedge\left\{q \in Q \mid p_{0} \leq g(q)\right\}\right)=g\left(f\left(p_{0}\right) \right),$
fong-spivak-seven-sketches_EQ0015	44	1.000	`f\left(g\left(q_{0}\right)\right)=\bigwedge\left\{q \in Q \mid g\left(q_{0}\right) \leq g(q)\right\} \leq \bigwedge \left\{q_{0}\right\}=q_{0},`	$f\left(g\left(q_{0}\right)\right)=\bigwedge\left\{q \in Q \mid g\left(q_{0}\right) \leq g(q)\right\} \leq \bigwedge \left\{q_{0}\right\}=q_{0},$	$f\left(g\left(q_{0}\right)\right)=\bigwedge\left\{q \in Q \mid g\left(q_{0}\right) \leq g(q)\right\} \leq \bigwedge \left\{q_{0}\right\}=q_{0},$
fong-spivak-seven-sketches_EQ0016	45	1.000	`f_{!}\left(A^{\prime}\right):=\left\{b \in B \mid \text { there exists } a \in A^{\prime} \text { such that } f(a)=b\right\}`	$f_{!}\left(A^{\prime}\right):=\left\{b \in B \mid \text { there exists } a \in A^{\prime} \text { such that } f(a)=b\right\}$	$f_{!}\left(A^{\prime}\right):=\left\{b \in B \mid \text { there exists } a \in A^{\prime} \text { such that } f(a)=b\right\}$
fong-spivak-seven-sketches_EQ0017	45	1.000	`f_{*}\left(A^{\prime}\right):=\left\{b \in B \mid \text { for all } a \text { such that } f(a)=b, \text { we have } a \in A^{\prime}\right\}`	$f_{*}\left(A^{\prime}\right):=\left\{b \in B \mid \text { for all } a \text { such that } f(a)=b, \text { we have } a \in A^{\prime}\right\}$	$f_{*}\left(A^{\prime}\right):=\left\{b \in B \mid \text { for all } a \text { such that } f(a)=b, \text { we have } a \in A^{\prime}\right\}$
fong-spivak-seven-sketches_EQ0019 (2.7)	54	1.000	`m * e=m, \quad e * m=m, \quad(m * n) * p=m *(n * p)`	$m * e=m, \quad e * m=m, \quad(m * n) * p=m *(n * p)$	$m * e=m, \quad e * m=m, \quad(m * n) * p=m *(n * p)$

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fong-spivak-seven-sketches EQ0023 (2.16)	59	1.000	`t \leq v+w \quad w+u \leq x+z \quad v+x \leq y`	$t \leq v+w \quad w+u \leq x+z \quad v+x \leq y$	$t \leq v+w \qquad w+u \leq x+z \qquad v+x \leq y$
fong-spivak-seven-sketches EQ0024 (2.17)	59	1.000	`t+u \leq y+z .`	$t+u \leq y+z.$	$t+u \leq y+z.$
fong-spivak-seven-sketches EQ0025 (2.18)	59	1.000	`t+u \leq v+w+u \leq v+x+z \leq y+z .`	$t+u \leq v+w+u \leq v+x+z \leq y+z.$	$t+u \leq v+w+u \leq v+x+z \leq y+z.$
fong-spivak-seven-sketches EQ0027 (2.24)	61	1.000	`2 \mathrm{H}_{2} \mathrm{O}+2 \mathrm{Na} \rightarrow 2 \mathrm{NaOH}+\mathrm{H}_{2} .`	$2\mathrm{H}_{2}\mathrm{O}+2\mathrm{Na} \rightarrow 2\mathrm{NaOH}+\mathrm{H}_{2}.$	$2\mathrm{H}_{2}\mathrm{O}+2\mathrm{Na} \rightarrow 2\mathrm{NaOH}+\mathrm{H}_{2}.$
fong-spivak-seven-sketches EQ0028 (2.22)	61	1.000	`y+k \rightarrow y^{\prime}+k^{\prime} \quad x+y^{\prime} \rightarrow z^{\prime} \quad z^{\prime}+k^{\prime} \rightarrow z+k`	$y+k \rightarrow y'+k' \quad x+y' \rightarrow z' \quad z'+k' \rightarrow z+k$	$y+k \rightarrow y'+k' \qquad x+y' \rightarrow z' \qquad z'+k' \rightarrow z+k$
fong-spivak-seven-sketches EQ0029 (2.23)	61	1.000	`x+y+k \rightarrow x+y^{\prime}+k^{\prime} \rightarrow z^{ \prime}+k^{\prime} \rightarrow z+k .`	$x+y+k \rightarrow x+y'+k' \rightarrow z'+k' \rightarrow z+k.$	$x+y+k \rightarrow x+y'+k' \rightarrow z'+k' \rightarrow z+k.$
fong-spivak-seven-sketches EQ0037 (2.66)	77	1.000	`f(x):= \begin{cases}\text { true } & \text { if } x=0 \\ \text { false } & \text { if } x>0\end{cases}`	$f(x) := \begin{cases}\text{true} & \text{if } x=0 \\ \text{false} & \text{if } x>0\end{cases}$	$f(x) := \begin{cases}\text{true} & \text{if } x=0 \\ \text{false} & \text{if } x>0\end{cases}$
fong-spivak-seven-sketches EQ0044 (2.88)	82	1.000	`\left(v \otimes \bigvee_{a \in A} a\right) \cong \bigvee_{a \in A}(v \otimes a) .`	$\left(v \otimes \bigvee_{a \in A} a\right) \cong \bigvee_{a \in A}(v \otimes a).$	$\left(v \otimes \bigvee_{a \in A} a\right) \cong \bigvee_{a \in A}(v \otimes a).$
fong-spivak-seven-sketches EQ0047 (2.99)	85	1.000	`(M * N)(i, k)=\sum_{j} M(i, j) * N(j, k) .`	$(M * N)(i,k)=\sum_{j} M(i,j) * N(j,k).$	$(M * N)(i,k)=\sum_{j} M(i,j) * N(j,k).$
fong-spivak-seven-sketches EQ0048 (2.101)	86	1.000	`(M * N)(x, z):=\bigvee_{y \in Y} M(x, y) \otimes N(y, z) .`	$(M * N)(x,z) := \bigvee_{y \in Y} M(x,y) \otimes N(y,z).$	$(M * N)(x,z) := \bigvee_{y \in Y} M(x,y) \otimes N(y,z).$
fong-spivak-seven-sketches EQ0049	86	1.000	`\left(\begin{array}{cc} \text { false } & \text { false } \\ \text { false } & \text { true } \\ \text { true } & \text { true } \\ \text { true } & \text { true } \end{array}\right) *\left(\begin{array}{ccc} \text { true } & \text { true } & \text { false } \\ \text { true } & \text { false } & \text { true } \end{array}\right)=\left(\begin{array}{ccc} \text { false } & \text { false } & \text { false } \\ \text { true } & \text { false } & \text { true } \\ \text { true } & \text { true } & \text { true } \end{array}\right)`	$\begin{pmatrix} \text{false} & \text{false} \\ \text{false} & \text{true} \\ \text{true} & \text{true} \\ \text{true} & \text{true} \end{pmatrix} * \begin{pmatrix} \text{true} & \text{true} & \text{false} \\ \text{true} & \text{false} & \text{true} \end{pmatrix} = \begin{pmatrix} \text{false} & \text{false} & \text{false} \\ \text{true} & \text{false} & \text{true} \\ \text{true} & \text{true} & \text{true} \\ \text{true} & \text{true} & \text{true} \end{pmatrix}$	$\begin{pmatrix} \text{false} & \text{false} \\ \text{false} & \text{true} \\ \text{true} & \text{true} \end{pmatrix} * \begin{pmatrix} \text{true} & \text{true} & \text{false} \\ \text{true} & \text{false} & \text{true} \end{pmatrix} = \begin{pmatrix} \text{false} & \text{false} & \text{false} \\ \text{true} & \text{false} & \text{true} \\ \text{true} & \text{true} & \text{true} \end{pmatrix}$
fong-spivak-seven-sketches EQ0050	86	1.000	`I_{X}(x, y):= \begin{cases}I & \text { if } x=y \\ 0 & \text { if } x \neq y .\end{cases}`	$I_{X}(x,y) := \begin{cases}I & \text{if } x=y \\ 0 & \text{if } x \neq y.\end{cases}$	$I_{X}(x,y) := \begin{cases}I & \text{if } x=y \\ 0 & \text{if } x \neq y.\end{cases}$
fong-spivak-seven-sketches EQ0051	87	1.000	`M_{Y}^{2}=\begin{array}{c|ccc} \nearrow & x & y & z \\ \hline x & 0 & 4 & 3 \\ y & 3 & 0 & 6 \\ z & 7 & 4 & 0 \end{array}`	$M_{Y}^{2} = \begin{array}{c\|ccc} \nearrow & x & y & z \\ \hline x & 0 & 4 & 3 \\ y & 3 & 0 & 6 \\ z & 7 & 4 & 0 \end{array}$	$M_{Y}^{2} = \begin{array}{c\|ccc} \nearrow & x & y & z \\ \hline x & 0 & 4 & 3 \\ y & 3 & 0 & 6 \\ z & 7 & 4 & 0 \end{array}$

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fong-spivak-seven-sketches EQ0052	87	1.000	`M_{Y}^{3}=\begin{array}{c|ccc} \nearrow & x & y & z \\ \hline x & 0 & 4 & 3 \\ y & 3 & 0 & 6 \\ z & 7 & 4 & 0 \end{array}`	$M_Y^3 = \begin{array}{c\|ccc} \nearrow & x & y & z \\ \hline x & 0 & 4 & 3 \\ y & 3 & 0 & 6 \\ z & 7 & 4 & 0 \end{array}$	$M_Y^3 = \begin{array}{c\|ccc} \nearrow & x & y & z \\ \hline x & 0 & 4 & 3 \\ y & 3 & 0 & 6 \\ z & 7 & 4 & 0 \end{array}$
fong-spivak-seven-sketches EQ0055	96	1.000	`\{A, B, C, D, f, g, h, i, f ; h\}`	$\{A, B, C, D, f, g, h, i, f; h\}$	$\{A, B, C, D, f, g, h, i, f \fatsemi h\}$
fong-spivak-seven-sketches EQ0058	104	1.000	`f^{\prime} ; h^{\prime}=F(f) ; F(h)=F(f ; h)=F(g ; i)=F(g) ; F(i)=g^{\prime} ; i^{\prime}`	$f'; h' = F(f); F(h) = F(f; h) = F(g; i) = F(g); F(i) = g'; i'$	$f' \fatsemi h' = F(f) \fatsemi F(h) = F(f \fatsemi h) = F(g \fatsemi i) = F(g) \fatsemi F(i) = g' \fatsemi i'$
fong-spivak-seven-sketches EQ0060 (3.50)	107	1.000	`F(f) ; \alpha_{d}=\alpha_{c} ; G(f) .`	$F(f); \alpha_d = \alpha_c; G(f).$	$F(f) \fatsemi \alpha_d = \alpha_c \fatsemi G(f).$
fong-spivak-seven-sketches EQ0062	110	1.000	`\alpha_{\text {Vertex }}: G(\text { Vertex }) \rightarrow H(\text { Vertex }) \quad \text { and } \quad \alpha_{ \text {Arrow }}: G(\text { Arrow }) \rightarrow H(\text { Arrow }),`	$\alpha_{\text{Vertex }}: G(\text{ Vertex }) \rightarrow H(\text{ Vertex }) \quad \text{ and } \quad \alpha_{\text{Arrow }}: G(\text{ Arrow }) \rightarrow H(\text{ Arrow }),$	$\alpha_{\text{Vertex}}: G(\text{Vertex}) \rightarrow H(\text{Vertex}) \quad \text{and} \quad \alpha_{\text{Arrow}}: G(\text{Arrow}) \rightarrow H(\text{Arrow}),$
fong-spivak-seven-sketches EQ0067	114	1.000	`\alpha_{c, d}: \mathcal{C}(c, R(d)) \xrightarrow{\cong} \mathcal{D}(L(c), d)`	$\alpha_{c,d}: \mathcal{C}(c, R(d)) \xrightarrow{\cong} \mathcal{D}(L(c), d)$	$\alpha_{c,d}: \mathcal{C}(c, R(d)) \xrightarrow{\cong} \mathcal{D}(L(c), d)$
fong-spivak-seven-sketches EQ0076	121	1.000	`X \times Y:=\{(x, y) \mid x \in X, y \in Y\},`	$X \times Y := \{(x, y) \mid x \in X, y \in Y\},$	$X \times Y := \{(x, y) \mid x \in X, y \in Y\},$
fong-spivak-seven-sketches EQ0090	141	1.000	`(\Phi ; \Psi) ; \Upsilon=\Phi ;(\Psi ; \Upsilon) .`	$(\Phi; \Psi); \Upsilon = \Phi; (\Psi; \Upsilon).$	$(\Phi \fatsemi \Psi) \fatsemi \Upsilon = \Phi \fatsemi (\Psi \fatsemi \Upsilon).$
fong-spivak-seven-sketches EQ0095	148	1.000	`\alpha_{s, t, u}:\{(s,(t, u)) \mid s \in S, t \in T, u \in U\} \xrightarrow{\cong}\{((s, t), u) \mid s \in S, t \in T, u \in U\} .`	$\alpha_{s,t,u}: \{(s,(t,u)) \mid s \in S, t \in T, u \in U\} \xrightarrow{\cong} \{((s,t),u) \mid s \in S, t \in T, u \in U\}.$	$\alpha_{s,t,u}: \{(s,(t,u)) \mid s \in S, t \in T, u \in U\} \xrightarrow{\cong} \{((s,t),u) \mid s \in S, t \in T, u \in U\}.$
fong-spivak-seven-sketches EQ0099	156	1.000	`(\Phi \times \Psi)\left(\left(x_{1}, y_{1}\right), \left(x_{2}, y_{2}\right)\right):=\Phi\left(x_{1}, x_{2} \right) \otimes \Psi\left(y_{1}, y_{2}\right) .`	$(\Phi \times \Psi)\left(\left(x_1, y_1\right), \left(x_2, y_2\right)\right) := \Phi\left(x_1, x_2\right) \otimes \Psi\left(y_1, y_2\right).$	$(\Phi \times \Psi)((x_1, y_1), (x_2, y_2)) := \Phi(x_1, x_2) \otimes \Psi(y_1, y_2).$
fong-spivak-seven-sketches EQ0101 (5.4)	162	1.000	`i \longmapsto \begin{cases}f(i) & \text { if } 1 \leq i \leq m ; \\ m^{\prime}+g(i) & \text { if } m+1 \leq i \leq m+n .\end{cases}`	$i \longmapsto \begin{cases} f(i) & \text{ if } 1 \leq i \leq m; \\ m' + g(i) & \text{ if } m+1 \leq i \leq m+n. \end{cases}$	$i \longmapsto \begin{cases} f(i) & \text{ if } 1 \leq i \leq m; \\ m' + g(i) & \text{ if } m+1 \leq i \leq m+n. \end{cases}$
fong-spivak-seven-sketches EQ0106 (5.26)	168	1.000	`G:=\left\{\rho_{m, n} \mid m, n \in \mathbb{N}\right\}, \quad s\left(\rho_{m, n}\right):=m, \quad t\left(\rho_{m, n}\right):=n,`	$G := \{\rho_{m,n} \mid m, n \in \mathbb{N}\}, \quad s(\rho_{m,n}) := m, \quad t(\rho_{m,n}) := n,$	$G := \{\rho_{m,n} \mid m, n \in \mathbb{N}\}, \quad s(\rho_{m,n}) := m, \quad t(\rho_{m,n}) := n,$
fong-spivak-seven-sketches EQ0108	174	1.000	`\begin{array}{r} D x+3 D^{2} y-2 z=0 \\ D^{2} y+5 D z=0 \end{array}`	$\begin{array}{r} Dx + 3D^2y - 2z = 0 \\ D^2y + 5Dz = 0 \end{array}$	$\begin{array}{r} Dx + 3D^2y - 2z = 0 \\ D^2y + 5Dz = 0 \end{array}$
fong-spivak-seven-sketches EQ0110 (5.48)	176	1.000	`M ; N(a, c):=\sum_{b \in \underline{n}} M(a, b) \times N(b, c),`	$M; N(a, c) := \sum_{b \in \underline{n}} M(a, b) \times N(b, c),$	$M \fatsemi N(a, c) := \sum_{b \in \underline{n}} M(a, b) \times N(b, c),$
fong-spivak-seven-sketches EQ0112	176	1.000	`A=\left(\begin{array}{lll} 3 & 3 & 1 \\ 2 & 0 & 4 \end{array}\right) \quad B=\left(\begin{array}{llll} 2 & 5 & 6 & 1 \end{array}\right) .`	$A = \begin{pmatrix} 3 & 3 & 1 \\ 2 & 0 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 2 & 5 & 6 & 1 \end{pmatrix}.$	$A = \begin{pmatrix} 3 & 3 & 1 \\ 2 & 0 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 2 & 5 & 6 & 1 \end{pmatrix}.$
fong-spivak-seven-sketches EQ0114	179	1.000	`\sum_{j \in \underline{n}} \alpha(i, j) * \beta(j, k) .`	$\sum_{j \in \underline{n}} \alpha(i, j) * \beta(j, k).$	$\sum_{j \in \underline{n}} \alpha(i, j) * \beta(j, k).$

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fong-spivak-seven-sketches EQ0118 (5.76)	186	1.000	`\mathrm{B}\left(g^{\mathrm{op}}\right):=\left\{(S(g)(x), x) \mid x \in R^{m}\right\} \subseteq R^{n} \times R^{m} .`	$\mathrm{B}\left(g^{\mathrm{op}}\right):=\{(S(g)(x), x) \mid x \in R^{m}\} \subseteq R^{n} \times R^{m}$.	$\mathrm{B}(g^{\mathrm{op}}) \coloneqq \left\{\left(S(g)(x), x\right) \mid x \in R^{m}\right\} \subseteq R^{n} \times R^{m}$.
fong-spivak-seven-sketches EQ0122	188	1.000	`\mathrm{B}\left(\left(g^{\mathrm{op}}\right) ; h\right)= \left\{(S(g)(x), S(h)(x)) \mid x \in R^{m}\right\} .`	$\mathrm{B}\left(\left(g^{\mathrm{op}}\right) ; h\right)=\{(S(g)(x), S(h)(x)) \mid x \in R^{m}\}$.	$\mathrm{B}((g^{\mathrm{op}}) \fatsemi h) = \{(S(g)(x), S(h)(x)) \mid x \in R^{m}\}$.
fong-spivak-seven-sketches EQ0127	203	1.000	`y(0)=y(g(0))=x(f(0))=x(0) .`	$y(0)=y(g(0))=x(f(0))=x(0)$.	$y(0) = y(g(0)) = x(f(0)) = x(0)$.
fong-spivak-seven-sketches EQ0130	206	1.000	`\{(v, d) \mid d \in D(v)\}`	$\{(v, d) \mid d \in D(v)\}$	$\{(v, d) \mid d \in D(v)\}$
fong-spivak-seven-sketches EQ0135 (6.76)	219	1.000	`F\left(\left[\iota_{N}, \iota_{P}\right]\right)\left( \varphi_{N, P}(s, t)\right)`	$F\left(\left[\iota_N, \iota_P\right]\right)\left(\varphi_{N,P}(s, t)\right)$	$F([\iota_N, \iota_P])(\varphi_{N,P}(s, t))$
fong-spivak-seven-sketches EQ0138	220	1.000	`\operatorname{Circ}(V):=\{(V, A, s, t, \ell) \mid \text { where } s, t: A \rightarrow V, \ell: E \rightarrow C\} .`	$\operatorname{Circ}(V):=\{(V, A, s, t, \ell) \mid \text{ where } s, t: A \rightarrow V, \ell: E \rightarrow C\}$.	$\operatorname{Circ}(V) \coloneqq \{(V, A, s, t, \ell) \mid \text{ where } s, t: A \to V, \ell: E \to C\}$.
fong-spivak-seven-sketches EQ0141	225	1.000	`\circ_{i}: \mathcal{O}\left(s_{1}, \ldots, s_{m} ; t_{i} \right) \times \mathcal{O}\left(t_{1}, \ldots, t_{n} ; t\right) \rightarrow \mathcal{O}\left(t_{1}, \ldots, t_{i-1}, s_{1}, \ldots, s_{m}, t_{i+1}, \ldots, t_{n} ; t \right) ;`	$\circ_i: \mathcal{O}\left(s_1, \ldots, s_m ; t_i\right) \times \mathcal{O}\left(t_1, \ldots, t_n ; t\right) \rightarrow \mathcal{O}\left(t_1, \ldots, t_{i-1}, s_1, \ldots, s_m, t_{i+1}, \ldots, t_n ; t\right) ;$	$\circ_i: \mathcal{O}(s_1, \ldots, s_m; t_i) \times \mathcal{O}(t_1, \ldots, t_n; t) \to \mathcal{O}(t_1, \ldots, t_{i-1}, s_1, \ldots, s_m, t_{i+1}, \ldots, t_n; t);$
fong-spivak-seven-sketches EQ0145	229	1.000	`F: \mathcal{O}\left(t_{1}, \ldots, t_{n} ; t\right) \rightarrow \mathcal{P}\left(f\left(t_{1}\right), \ldots, f\left(t_{n}\right) ; f(t)\right)`	$F: \mathcal{O}\left(t_1, \ldots, t_n ; t\right) \rightarrow \mathcal{P}\left(f\left(t_1\right), \ldots, f\left(t_n\right) ; f(t)\right)$	$F: \mathcal{O}(t_1, \ldots, t_n; t) \to \mathcal{P}(f(t_1), \ldots, f(t_n); f(t))$
fong-spivak-seven-sketches EQ0149 (7.10)	239	1.000	`\mathcal{C}(A \times C, D) \cong \mathcal{C}\left(A, D^{C}\right)`	$\mathcal{C}(A \times C, D) \cong \mathcal{C}\left(A, D^{C}\right)$	$\mathcal{C}(A \times C, D) \cong \mathcal{C}(A, D^{C})$
fong-spivak-seven-sketches EQ0151	241	1.000	`\ulcorner m\urcorner(y):= \begin{cases}\text { true } & \text { if } m(x)=y \text { for some } x \in X \\ \text { false } & \text { otherwise }\end{cases}`	$\ulcorner m \urcorner(y) := \begin{cases} \text{true} & \text{if } m(x)=y \text{ for some } x \in X \\ \text{false} & \text{otherwise} \end{cases}$	$\ulcorner m \urcorner(y) := \begin{cases} \texttt{true} & \text{if } m(x)=y \text{ for some } x \in X \\ \texttt{false} & \text{otherwise} \end{cases}$
fong-spivak-seven-sketches EQ0152 (7.15)	241	1.000	`X=\{y \in Y \mid p(y)=\text { true }\} .`	$X=\{y \in Y \mid p(y)=\text{ true }\}$.	$X = \{y \in Y \mid p(y) = \texttt{true}\}$.
fong-spivak-seven-sketches EQ0155	246	1.000	`B(p ; \epsilon):=\left\{p^{\prime} \in \mathbb{R}^{2} \mid d\left(p, p^{\prime}\right)<\epsilon\right\}^{7}`	$B(p ; \epsilon):=\left\{p^{\prime} \in \mathbb{R}^{2} \mid d\left(p, p^{\prime}\right)<\epsilon\right\}^{7}$	$B(p; \epsilon) \coloneqq \{p' \in \mathbb{R}^2 \mid d(p, p') < \epsilon\}^7$
fong-spivak-seven-sketches EQ0161 (7.51)	255	1.000	`\begin{aligned} \Omega(U) & \rightarrow \Omega(V) \\ U^{\prime} & \mapsto U^{\prime} \cap V . \end{aligned}`	$\begin{aligned} \Omega(U) & \rightarrow \Omega(V) \\ U^{\prime} & \mapsto U^{\prime} \cap V . \end{aligned}$	$\begin{aligned} \Omega(U) & \to \Omega(V) \\ U' & \mapsto U' \cap V. \end{aligned}$
fong-spivak-seven-sketches EQ0162	256	1.000	`V \cap U_{j}=\left(\bigcup_{i \in I} V_{i}\right) \cap U_{j}=\bigcup_{i \in I}\left(V_{i} \cap U_{j}\right)= \bigcup_{i \in I}\left(V_{j} \cap U_{i}\right)=\left( \bigcup_{i \in I} U_{i}\right) \cap V_{j}=V_{j}`	$V \cap U_j=\left(\bigcup_{i \in I} V_i\right) \cap U_j=\bigcup_{i \in I}\left(V_i \cap U_j\right)=\bigcup_{i \in I}\left(V_j \cap U_i\right)=\left(\bigcup_{i \in I} U_i\right) \cap V_j=V_j$	$V \cap U_j = \left(\bigcup_{i \in I} V_i\right) \cap U_j = \bigcup_{i \in I}(V_i \cap U_j) = \bigcup_{i \in I}(V_j \cap U_i) = \left(\bigcup_{i \in I} U_i\right) \cap V_j = V_j$
fong-spivak-seven-sketches EQ0167 (7.63)	259	1.000	`\left(\left|\Omega^{S}\right|, \leq^{S}\right)`	$\left(\left\|\Omega^{S}\right\|, \leq^{S}\right)$	$(\|\Omega^S\|, \leq^S)$
fong-spivak-seven-sketches EQ0170	261	1.000	`p(n, z)= \begin{cases}\text { true } & \text { if } n \leq|z| \\ \text { false } & \text { if } n>|z| . \end{cases}`	$p(n, z)=\begin{cases} \text{true} & \text{if } n \leq \|z\| \\ \text{false} & \text{if } n>\|z\|. \end{cases}$	$p(n, z) = \begin{cases} \texttt{true} & \text{if } n \leq \|z\| \\ \texttt{false} & \text{if } n > \|z\|. \end{cases}$
fong-spivak-seven-sketches EQ0174	265	1.000	`S\left(o_{[a, b]}\right) \cong \lim _{\epsilon>0} S \left(o_{[a-\epsilon, b+\epsilon]}\right) .`	$S\left(o_{[a, b]}\right) \cong \lim_{\epsilon>0} S\left(o_{[a-\epsilon, b+\epsilon]}\right)$.	$S(o_{[a,b]}) \cong \lim_{\epsilon>0} S(o_{[a-\epsilon, b+\epsilon]})$.

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fong-spivak-seven-sketches_EQ0177	272	1.000	(h, 1), \quad(h, 2), \quad(h, 3), \quad(1,1), \quad(1,2), \quad(1,3) .	$(h,1), \quad (h,2), \quad (h,3), \quad (1,1), \quad (1,2), \quad (1,3).$	$(h,1), \quad (h,2), \quad (h,3), \quad (1,1), \quad (1,2), \quad (1,3).$
fong-spivak-seven-sketches_EQ0178	272	1.000	(h, 1), \quad(1,1), \quad(1,2), \quad(2,2), \quad(3,2) .	$(h,1), \quad (1,1), \quad (1,2), \quad (2,2), \quad (3,2).$	$(h,1), \quad (1,1), \quad (1,2), \quad (2,2), \quad (3,2).$
fong-spivak-seven-sketches_EQ0180	273	1.000	\begin{array}{lllll} (11,11) & (11,12) & (12,11) & (12,12) & (13,13) \\ (21,21) & (22,22) & (12,23) & (23,22) & (23,23) \end{array}	$\begin{array}{lllll} (11,11) & (11,12) & (12,11) & (12,12) & (13,13) \\ (21,21) & (22,22) & (12,23) & (23,22) & (23,23) \end{array}$	$\begin{array}{lllll} (11,11) & (11,12) & (12,11) & (12,12) & (13,13) \\ (21,21) & (22,22) & (12,23) & (23,22) & (23,23) \end{array}$
fong-spivak-seven-sketches_EQ0182	274	1.000	1 \leq 1, \quad 1 \leq 2, \quad 1 \leq 3, \quad 2 \leq 2, \quad 2 \leq 3, \quad 3 \leq 3, \quad 4 \leq 4	$1 \leq 1, \quad 1 \leq 2, \quad 1 \leq 3, \quad 2 \leq 2, \quad 2 \leq 3, \quad 3 \leq 3, \quad 4 \leq 4$	$1 \leq 1, \quad 1 \leq 2, \quad 1 \leq 3, \quad 2 \leq 2, \quad 2 \leq 3, \quad 3 \leq 3, \quad 4 \leq 4$
fong-spivak-seven-sketches_EQ0183	274	1.000	(\bullet)(\circ)(*), \quad(\bullet \circ)(*), \quad(\bullet *)(\circ), \quad(\bullet)(\circ *), \quad(\bullet \circ *)	$(\bullet)(\circ)(*), \quad (\bullet\circ)(*), \quad (\bullet *)(\circ), \quad (\bullet)(\circ *), \quad (\bullet \circ *)$	$(\bullet)(\circ)(*), \quad (\bullet\circ)(*), \quad (\bullet *)(\circ), \quad (\bullet)(\circ *), \quad (\bullet \circ *)$
fong-spivak-seven-sketches_EQ0190	280	1.000	g(q) \leq g^{\prime}(f(g(q))) \leq g^{\prime}(q) .	$g(q) \leq g^{\prime}(f(g(q))) \leq g^{\prime}(q).$	$g(q) \leq g^{\prime}(f(g(q))) \leq g^{\prime}(q).$
fong-spivak-seven-sketches_EQ0192	283	1.000	\begin{gathered} g(\text { false })+g(\text { false })= \infty+\infty \geq \infty=g(\text { false } \wedge \text { false }) \\ g(\text { false })+g(\text { true })= \infty+0 \geq \infty=g(\text { false } \wedge \text { true }) \\ g(\text { true })+g(\text { false })=0+\infty \geq \infty=g(\text { true } \wedge \text { false }) \\ g(\text { true })+g(\text { true })=0+0 \geq 0=g(\text { true } \wedge \text { true }) \end{gathered}	$\begin{gathered} g(\text { false })+g(\text { false })= \infty+\infty \geq \infty=g(\text { false } \wedge \text { false }) \\ g(\text { false })+g(\text { true })= \infty+0 \geq \infty=g(\text { false } \wedge \text { true }) \\ g(\text { true })+g(\text { false })=0+\infty \geq \infty=g(\text { true } \wedge \text { false }) \\ g(\text { true })+g(\text { true })=0+0 \geq 0=g(\text { true } \wedge \text { true }) \end{gathered}$	$\begin{gathered} g(\text { false })+g(\text { false })= \infty+\infty \geq \infty=g(\text { false } \wedge \text { false }) \\ g(\text { false })+g(\text { true })= \infty+0 \geq \infty=g(\text { false } \wedge \text { true }) \\ g(\text { true })+g(\text { false })=0+\infty \geq \infty=g(\text { true } \wedge \text { false }) \\ g(\text { true })+g(\text { true })=0+0 \geq 0=g(\text { true } \wedge \text { true }). \end{gathered}$
fong-spivak-seven-sketches_EQ0196	287	1.000	\left(\begin{array}{ll} 1 & 0 \\ 0 & 1 \end{array} \right), \quad\left(\begin{array}{cc} \text { true } & \text { false } \\ \text { false } & \text { true } \end{array}\right), \quad \text { and } \quad\left(\begin{array}{cc} 0 & \infty \\ \infty & 0 \end{array} \right) .	$\left(\begin{array}{ll} 1 & 0 \\ 0 & 1 \end{array} \right), \quad\left(\begin{array}{cc} \text { true } & \text { false } \\ \text { false } & \text { true } \end{array}\right), \quad \text { and } \quad\left(\begin{array}{cc} 0 & \infty \\ \infty & 0 \end{array} \right) .$	$\left(\begin{array}{ll} 1 & 0 \\ 0 & 1 \end{array} \right), \quad\left(\begin{array}{cc} \text { true } & \text { false } \\ \text { false } & \text { true } \end{array}\right), \quad \text { and } \quad\left(\begin{array}{cc} 0 & \infty \\ \infty & 0 \end{array} \right) .$
fong-spivak-seven-sketches_EQ0197	287	1.000	0 \otimes v \cong v \otimes 0 \cong\left(v \otimes \bigvee_{a \in \varnothing} a\right)=\bigvee_{a \in \varnothing}(v \otimes a)=0 .	$0 \otimes v \cong v \otimes 0 \cong \left(v \otimes \bigvee_{a \in \varnothing} a\right)=\bigvee_{a \in \varnothing}(v \otimes a)=0 .$	$0 \otimes v \cong v \otimes 0 \cong \left(v \otimes \bigvee_{a \in \varnothing} a\right)=\bigvee_{a \in \varnothing}(v \otimes a)=0 .$
fong-spivak-seven-sketches_EQ0200	288	1.000	M_{X}=\left(\begin{array}{cccc} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & 5 \\ \infty & 3 & 0 & \infty \\ \infty & \infty & 6 & 0 \end{array}\right) \quad M_{X}^{2}=\left(\begin{array}{cccc} 0 & 6 & 3 & \infty \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ \infty & 9 & 6 & 0 \end{array}\right) \quad M_{X}^{3}=M_{X}^{4}=\left(\begin{array}{cccc} 0 & 6 & 3 & 11 \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ 11 & 9 & 6 & 0 \end{array}\right)	$M_X=\left(\begin{array}{cccc} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & 5 \\ \infty & 3 & 0 & \infty \\ \infty & \infty & 6 & 0 \end{array}\right) \quad M_X^2=\left(\begin{array}{cccc} 0 & 6 & 3 & \infty \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ \infty & 9 & 6 & 0 \end{array}\right) \quad M_X^3=M_X^4=\left(\begin{array}{cccc} 0 & 6 & 3 & 11 \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ 11 & 9 & 6 & 0 \end{array}\right)$	$M_X=\left(\begin{array}{cccc} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & 5 \\ \infty & 3 & 0 & \infty \\ \infty & \infty & 6 & 0 \end{array}\right) \quad M_X^2=\left(\begin{array}{cccc} 0 & 6 & 3 & \infty \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ \infty & 9 & 6 & 0 \end{array}\right) \quad M_X^3=M_X^4=\left(\begin{array}{cccc} 0 & 6 & 3 & 11 \\ 2 & 0 & 5 & 5 \\ 5 & 3 & 0 & 8 \\ 11 & 9 & 6 & 0 \end{array}\right)$
fong-spivak-seven-sketches_EQ0201	289	1.000	t(p):=\left\{\begin{array}{l} v \text { if } n=0 \\ t \left(a_{n}\right) \text { if } n \geq 1 \end{array} \right.	$t(p):=\left\{\begin{array}{l} v \text { if } n=0 \\ t\left(a_{n}\right) \text { if } n \geq 1 \end{array}\right.$	$t(p):=\left\{\begin{array}{l} v \text { if } n=0 \\ t\left(a_{n}\right) \text { if } n \geq 1 \end{array}\right.$
fong-spivak-seven-sketches_EQ0202	289	1.000	(p ; q):=\left(v, a_{1}, \ldots, a_{m}, b_{1}, \ldots, b_{n}\right) .	$(p ; q):=\left(v, a_{1}, \ldots, a_{m}, b_{1}, \ldots, b_{n}\right) .$	$(p ; q):=\left(v, a_{1}, \ldots, a_{m}, b_{1}, \ldots, b_{n}\right) .$

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fong-spivak-seven-sketches_EQ0203	289	■1.000	`\left(v, a_{1}, \ldots, a_{m}, b_{1}, \ldots, b_{n}, c_{1}, \ldots, c_{o}\right) .`	$\left(v, a_{1}, \ldots, a_{m}, b_{1}, \ldots, b_{n}, c_{1}, \ldots, c_{o}\right) .$	$\left(v, a_{1}, \ldots, a_{m}, b_{1}, \ldots, b_{n}, c_{1}, \ldots, c_{o}\right).$
fong-spivak-seven-sketches_EQ0207	291	■1.000	`\begin{array}{lll} (1,1) & (1,2) & (1,3) \\ (2,1) & (2,2) & (2,3) \\ (3,1) & (3,2) & (3,3) \end{array}`	$\begin{array}{lll} (1,1) & (1,2) & (1,3) \\ (2,1) & (2,2) & (2,3) \\ (3,1) & (3,2) & (3,3) \end{array}$	$\begin{array}{lll} (1,1) & (1,2) & (1,3) \\ (2,1) & (2,2) & (2,3) \\ (3,1) & (3,2) & (3,3) \end{array}$
fong-spivak-seven-sketches_EQ0208	291	■1.000	`f^{-1}(1)=b, \quad f^{-1}(2)=a, \quad f^{-1}(3)=c .`	$f^{-1}(1)=b, \quad f^{-1}(2)=a, \quad f^{-1}(3)=c.$	$f^{-1}(1)=b, \quad f^{-1}(2)=a, \quad f^{-1}(3)=c.$
fong-spivak-seven-sketches_EQ0209	291	■1.000	`\begin{gathered} A^{\prime} \mapsto A, \quad f^{\prime} \mapsto f, \quad g^{\prime} \mapsto g, \quad f^{\prime} ; h^{\prime} \mapsto f ; h, \quad g^{\prime} ; i^{\prime} \mapsto f ; h, \\ B^{\prime} \mapsto B, \quad h^{\prime} \mapsto h, \quad C^{\prime} \mapsto C, \quad i^{\prime} \mapsto i, \quad D^{\prime} \mapsto D . \end{gathered}`	$\begin{gathered} A^{\prime} \mapsto A, \quad f^{\prime} \mapsto f, \quad g^{\prime} \mapsto g, \quad f^{\prime} ; h^{\prime} \mapsto f ; h, \quad g^{\prime} ; i^{\prime} \mapsto f ; h, \\ B^{\prime} \mapsto B, \quad h^{\prime} \mapsto h, \quad C^{\prime} \mapsto C, \quad i^{\prime} \mapsto i, \quad D^{\prime} \mapsto D . \end{gathered}$	$\begin{gathered} A^{\prime} \mapsto A, \quad f^{\prime} \mapsto f, \quad g^{\prime} \mapsto g, \quad f^{\prime} ; h^{\prime} \mapsto f ; h, \quad g^{\prime} ; i^{\prime} \mapsto f ; h, \\ B^{\prime} \mapsto B, \quad h^{\prime} \mapsto h, \quad C^{\prime} \mapsto C, \quad i^{\prime} \mapsto i, \quad D^{\prime} \mapsto D . \end{gathered}$
fong-spivak-seven-sketches_EQ0211	292	■1.000	`(F ; G)(f ; g)=G(F(f) ; F(g))=G(F(f)) ; G(F(g))`	$(F ; G)(f ; g)=G(F(f) ; F(g))=G(F(f)) ; G(F(g))$	$(F ; G)(f ; g)=G(F(f) ; F(g))=G(F(f)) ; G(F(g))$
fong-spivak-seven-sketches_EQ0212	292	■1.000	`((F ; G) ; H)(c)=H((F ; G)(c))=H(G(F(c)))=(G ; H)(F(c))=(F ;(G ; H))(c) .`	$((F ; G) ; H)(c)=H((F ; G)(c))=H(G(F(c)))=(G ; H)(F(c))=(F ;(G ; H))(c) .$	$((F ; G) ; H)(c)=H((F ; G)(c))=H(G(F(c)))=(G ; H)(F(c))=(F ;(G ; H))(c) .$
fong-spivak-seven-sketches_EQ0215	295	■1.000	`\left(f_{1} ; f_{2}\right)^{B}(g)=g ;\left(f_{1} ; f_{2}\right)=\left(g ; f_{1}\right) ; f_{2}=\left(f_{1}^{B} ; f_{2}^{B}\right)(g)`	$\left(f_{1} ; f_{2}\right)^{B}(g)=g ;\left(f_{1} ; f_{2}\right)=\left(g ; f_{1}\right) ; f_{2}=\left(f_{1}^{B} ; f_{2}^{B}\right)(g)$	$\left(f_{1} ; f_{2}\right)^{B}(g)=g ;\left(f_{1} ; f_{2}\right)=\left(g ; f_{1}\right) ; f_{2}=\left(f_{1}^{B} ; f_{2}^{B}\right)(g)$
fong-spivak-seven-sketches_EQ0216	296	■1.000	`\left(c_{1}, d_{1}\right) \xrightarrow{\left(f_{1}, g_{1}\right)}\left(c_{2}, d_{2}\right) \xrightarrow{\left(f_{2}, g_{2}\right)}\left(c_{3}, d_{3}\right) \xrightarrow{\left(f_{3}, g_{3}\right)}\left(c_{4}, d_{4}\right) .`	$\left(c_{1}, d_{1}\right) \xrightarrow{\left(f_{1}, g_{1}\right)}\left(c_{2}, d_{2}\right) \xrightarrow{\left(f_{2}, g_{2}\right)}\left(c_{3}, d_{3}\right) \xrightarrow{\left(f_{3}, g_{3}\right)}\left(c_{4}, d_{4}\right) .$	$\left(c_{1}, d_{1}\right) \xrightarrow{\left(f_{1}, g_{1}\right)}\left(c_{2}, d_{2}\right) \xrightarrow{\left(f_{2}, g_{2}\right)}\left(c_{3}, d_{3}\right) \xrightarrow{\left(f_{3}, g_{3}\right)}\left(c_{4}, d_{4}\right).$
fong-spivak-seven-sketches_EQ0220	298	■1.000	`\left(\mathcal{X}^{\mathrm{op}} \times y\right)\left((x, y),\left(x^{\prime}, y^{\prime}\right)\right) \leq \mathcal{V}\left(\Phi(x, y), \Phi\left(x^{\prime}, y^{\prime}\right)\right) .`	$\left(\mathcal{X}^{\mathrm{op}} \times y\right)\left((x, y),\left(x^{\prime}, y^{\prime}\right)\right) \leq \mathcal{V}\left(\Phi(x, y), \Phi\left(x^{\prime}, y^{\prime}\right)\right) .$	$\left(\mathcal{X}^{\mathrm{op}} \times y\right)\left((x, y),\left(x^{\prime}, y^{\prime}\right)\right) \leq \mathcal{V}\left(\Phi(x, y), \Phi\left(x^{\prime}, y^{\prime}\right)\right).$
fong-spivak-seven-sketches_EQ0231	306	■1.000	`\sigma_{m, n}(i):= \begin{cases}i+n & \text { if } i \leq m \\ i-m & \text { if } m+1 \leq i\end{cases}`	$\sigma_{m, n}(i):=\begin{cases}i+n & \text { if } i \leq m \\ i-m & \text { if } m+1 \leq i\end{cases}$	$\sigma_{m, n}(i):=\begin{cases}i+n & \text { if } i \leq m \\ i-m & \text { if } m+1 \leq i\end{cases}$
fong-spivak-seven-sketches_EQ0232	306	■1.000	`(f+g)(i):= \begin{cases}f(i) & \text { if } i \leq m \\ g(i-m) & \text { if } m+1 \leq i\end{cases}`	$(f+g)(i):=\begin{cases}f(i) & \text { if } i \leq m \\ g(i-m) & \text { if } m+1 \leq i\end{cases}$	$(f+g)(i):=\begin{cases}f(i) & \text { if } i \leq m \\ g(i-m) & \text { if } m+1 \leq i\end{cases}$
fong-spivak-seven-sketches_EQ0233	308	■1.000	`a^{0}, a^{1}, a^{2}, a^{3}, \ldots, a^{2019}, \ldots`	$a^{0}, a^{1}, a^{2}, a^{3}, \ldots, a^{2019}, \ldots$	$a^{0}, a^{1}, a^{2}, a^{3}, \ldots, a^{2019}, \ldots$
fong-spivak-seven-sketches_EQ0234	308	■1.000	`[], \quad[a], \quad[b], \quad[a, a], \quad[a, b], \quad \ldots, \quad[b, a, b, b, a, b, a, a, a, a], \quad \ldots`	$[], \quad[a], \quad[b], \quad[a, a], \quad[a, b], \quad \ldots, \quad[b, a, b, b, a, b, a, a, a, a], \quad \ldots$	$[], \quad[a], \quad[b], \quad[a, a], \quad[a, b], \quad \ldots, \quad[b, a, b, b, a, b, a, a, a, a], \quad \ldots$
fong-spivak-seven-sketches_EQ0235	308	■1.000	`G:=\left\{\rho_{m, n}: m \rightarrow n \mid m, n \in \mathbb{N}\right\}, \quad s\left(\rho_{m, n}\right):=m, \quad t\left(\rho_{m, n}\right):=n ;`	$G:=\left\{\rho_{m, n}: m \rightarrow n \mid m, n \in \mathbb{N}\right\}, \quad s\left(\rho_{m, n}\right):=m, \quad t\left(\rho_{m, n}\right):=n ;$	$G:=\left\{\rho_{m, n}: m \rightarrow n \mid m, n \in \mathbb{N}\right\}, \quad s\left(\rho_{m, n}\right):=m, \quad t\left(\rho_{m, n}\right):=n ;$
fong-spivak-seven-sketches_EQ0236	309	■1.000	`\left(\begin{array}{llll} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}\right) .`	$\left(\begin{array}{llll} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}\right) .$	$\left(\begin{array}{llll} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}\right).$

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fong-spivak-seven-sketches EQ0237	309	1.000	A * B=\left(\begin{array}{ll} 0 & 1 \\ 0 & 0 \end{array}\right) *\left(\begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) \neq\left(\begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) *\left(\begin{array}{ll} 0 & 1 \\ 0 & 0 \end{array}\right)=B * A	$A * B=\left(\begin{array}{ll} 0 & 1 \\ 0 & 0 \end{array}\right) *\left(\begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) \neq\left(\begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) *\left(\begin{array}{ll} 0 & 1 \\ 0 & 0 \end{array}\right)=B * A$	$A * B=\left(\begin{array}{ll} 0 & 1 \\ 0 & 0 \end{array}\right) *\left(\begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) \neq\left(\begin{array}{ll} 0 & 1 \\ 1 & 0 \end{array}\right) *\left(\begin{array}{ll} 0 & 1 \\ 0 & 0 \end{array}\right)=B * A$
fong-spivak-seven-sketches EQ0238	309	1.000	A+B=\left(\begin{array}{lllllll} 3 & 3 & 1 & 0 & 0 & 0 & 0 \\ 2 & 0 & 4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & 5 & 6 & 1 \end{array}\right)	$A+B=\left(\begin{array}{lllllll} 3 & 3 & 1 & 0 & 0 & 0 & 0 \\ 2 & 0 & 4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & 5 & 6 & 1 \end{array}\right)$	$A+B=\left(\begin{array}{lllllll} 3 & 3 & 1 & 0 & 0 & 0 & 0 \\ 2 & 0 & 4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & 5 & 6 & 1 \end{array}\right)$
fong-spivak-seven-sketches EQ0239	310	1.000	\left(\begin{array}{lll} 1 & 1 & 1 \end{array}\right)	$\left(\begin{array}{lll} 1 & 1 & 1 \end{array}\right)$	$\left(\begin{array}{lll} 1 & 1 & 1 \end{array}\right)$
fong-spivak-seven-sketches EQ0240	310	1.000	\left(\begin{array}{lll} 1 & 1 & 1 \end{array}\right)	$\left(\begin{array}{lll} 1 & 1 & 1 \end{array}\right)$	$\left(\begin{array}{lll} 1 & 1 & 1 \end{array}\right)$
fong-spivak-seven-sketches EQ0241	310	1.000	g_{1}:=c_{n}+\cdots+c_{n}: m \rightarrow(m \times n),	$g_{1}:=c_{n}+\cdots+c_{n}: m \rightarrow(m \times n),$	$g_{1}:=c_{n}+\cdots+c_{n}: m \rightarrow(m \times n),$
fong-spivak-seven-sketches EQ0243	310	1.000	\begin{aligned} g_{2}:= & s_{M(1,1)}+\cdots+s_{M(1, n)} \\ & +s_{M(2,1)}+\cdots+s_{M(2, n)} \\ & +\cdots \\ & +s_{M(m, 1)}+\cdots+s_{M(m, n)}:(m \times n) \rightarrow(m \times n), \end{aligned}	$\begin{aligned} g_{2}:= & s_{M(1,1)}+\cdots+s_{M(1,n)} \\ & +s_{M(2,1)}+\cdots+s_{M(2,n)} \\ & +\cdots \\ & +s_{M(m,1)}+\cdots+s_{M(m,n)}:(m \times n) \rightarrow(m \times n), \end{aligned}$	$\begin{aligned} g_{2}:= & s_{M(1,1)}+\cdots+s_{M(1,n)} \\ & +s_{M(2,1)}+\cdots+s_{M(2,n)} \\ & +\cdots \\ & +s_{M(m,1)}+\cdots+s_{M(m,n)}:(m \times n) \rightarrow(m \times n), \end{aligned}$
fong-spivak-seven-sketches EQ0244	310	1.000	g_{4}:=a_{m}+\cdots+a_{m}:(m \times n) \rightarrow n,	$g_{4}:=a_{m}+\cdots+a_{m}:(m \times n) \rightarrow n,$	$g_{4}:=a_{m}+\cdots+a_{m}:(m \times n) \rightarrow n,$
fong-spivak-seven-sketches EQ0246	312	1.000	\mu:=\left(\begin{array}{ll} 1 & 0 \\ 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{array}\right)	$\mu:=\left(\begin{array}{ll} 1 & 0 \\ 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{array}\right)$	$\mu:=\left(\begin{array}{ll} 1 & 0 \\ 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{array}\right)$
fong-spivak-seven-sketches EQ0247	313	1.000	U(\mu)\left(\left(a_{1}, \ldots, a_{m}\right), \left(b_{1}, \ldots, b_{m}\right)\right):= \left(a_{1}+b_{1}, \ldots, a_{m}+b_{m}\right) .	$U(\mu)\left(\left(a_{1}, \ldots, a_{m}\right), \left(b_{1}, \ldots, b_{m}\right)\right):= \left(a_{1}+b_{1}, \ldots, a_{m}+b_{m}\right) .$	$U(\mu)\left(\left(a_{1}, \ldots, a_{m}\right), \left(b_{1}, \ldots, b_{m}\right)\right):= \left(a_{1}+b_{1}, \ldots, a_{m}+b_{m}\right) .$
fong-spivak-seven-sketches EQ0248	313	1.000	B+C:=\left\{(w, y, x, z) \in R^{m+p} \times R^{n+q} \mid(w, x) \in B \text { and }(y, z) \in C\right\} .	$B+C:=\left\{(w, y, x, z) \in R^{m+p} \times R^{n+q} \mid(w, x) \in B \text { and }(y, z) \in C\right\} .$	$B+C:=\left\{(w, y, x, z) \in R^{m+p} \times R^{n+q} \mid(w, x) \in B \text { and }(y, z) \in C\right\} .$
fong-spivak-seven-sketches EQ0249	313	1.000	\begin{aligned} \mathrm{B}(g) & =\left\{(x, z) \in R^{m} \times R^{n} \mid S(g)(x)=z\right\} \\ \mathrm{B}\left(h^{\mathrm{op}}\right) & =\left\{(z, y) \in R^{n} \times R^{\ell} \mid z=S(h)(y)\right\} \end{aligned}	$\begin{aligned} \mathrm{B}(g) & =\left\{(x, z) \in R^{m} \times R^{n} \mid S(g)(x)=z\right\} \\ \mathrm{B}\left(h^{\mathrm{op}}\right) & =\left\{(z, y) \in R^{n} \times R^{\ell} \mid z=S(h)(y)\right\} \end{aligned}$	$\begin{aligned} \mathrm{B}(g) & =\left\{(x, z) \in R^{m} \times R^{n} \mid S(g)(x)=z\right\} \\ \mathrm{B}\left(h^{\mathrm{op}}\right) & =\left\{(z, y) \in R^{n} \times R^{\ell} \mid z=S(h)(y)\right\} \end{aligned}$
fong-spivak-seven-sketches EQ0254	313	1.000	\mathrm{B}\left(\left(g^{\mathrm{op}}\right) ; h\right)= \left\{(S(g)(x), S(h)(x)) \mid x \in R^{m}\right\} .	$\mathrm{B}\left(\left(g^{\mathrm{op}}\right) ; h\right)=\left\{(S(g)(x), S(h)(x)) \mid x \in R^{m}\right\} .$	$\mathrm{B}\left(\left(g^{\mathrm{op}}\right) ; h\right)=\left\{(S(g)(x), S(h)(x)) \mid x \in R^{m}\right\} .$
fong-spivak-seven-sketches EQ0255	315	1.000	f(m)=f(\underbrace{1+1+\cdots+1}_{m \text { summands }})= \underbrace{f(1)+f(1)+\cdots+f(1)}_{m \text { summands }}=\underbrace{1_{R}+1_{R}+\cdots+1_{R}}_{m \text { summands }} .	$f(m)=f(\underbrace{1+1+\cdots+1}_{m \text { summands }})=\underbrace{f(1)+f(1)+\cdots+f(1)}_{m \text { summands }}=\underbrace{1_{R}+1_{R}+\cdots+1_{R}}_{m \text { summands }} .$	$f(m)=f(\underbrace{1+1+\cdots+1}_{m \text { summands }})=\underbrace{f(1)+f(1)+\cdots+f(1)}_{m \text { summands }}=\underbrace{1_{R}+1_{R}+\cdots+1_{R}}_{m \text { summands }} .$

Identifier	Page	Conf.	LaTeX source	Rendered	Image
fong-spivak-seven-sketches_EQ0261 (A.3)	327	1.000	`\begin{array}{cc||c|c} P & Q & P \wedge Q & P=(P \wedge Q) \\ \text { true } & \text { true } & \text { true } & \text { true } \\ \text { true } & \text { false } & \text { false } & \text { false } \\ \text { false } & \text { true } & \text { false } & \text { true } \\ \text { false } & \text { false } & \text { false } & \text { true } \\ \end{array}`	$\begin{array}{cc\|\|c\|c} P & Q & P \wedge Q & P=(P \wedge Q) \\ \text { true } & \text { true } & \text { true } & \text { true } \\ \text { true } & \text { false } & \text { false } & \text { false } \\ \text { false } & \text { true } & \text { false } & \text { true } \\ \text { false } & \text { false } & \text { false } & \text { true } \\ \end{array}$	$\begin{array}{cc\|\|c\|c} P & Q & P \wedge Q & P=(P \wedge Q) \\ \text { true } & \text { true } & \text { true } & \text { true } \\ \text { true } & \text { false } & \text { false } & \text { false } \\ \text { false } & \text { true } & \text { false } & \text { true } \\ \text { false } & \text { false } & \text { false } & \text { true } \\ \end{array}$
fong-spivak-seven-sketches_EQ0263	333	1.000	`U=\bigcup_{i \in I}\left\{x \in \mathbb{R} \mid a_{i}<x<b_{i}\right\}`	$U=\bigcup_{i \in I}\left\{x \in \mathbb{R} \mid a_{i}<x<b_{i}\right\}$	$U=\bigcup_{i \in I}\left\{x \in \mathbb{R} \mid a_{i}<x<b_{i}\right\}$
fong-spivak-seven-sketches_EQ0264	333	1.000	`U=\bigcup_{j \in J}\left\{x \in \mathbb{R} \mid a_{j}<x<b_{j}\right\}=\bigcup_{j \in J}\left(o_{\left[a_{j}, b_{j}\right]} \cap \mathbb{R}\right)=\left(\bigcup_{j \in J} o_{\left[a_{j}, b_{j}\right]}\right) \cap \mathbb{R}`	$U=\bigcup_{j \in J}\left\{x \in \mathbb{R} \mid a_{j}<x<b_{j}\right\}=\bigcup_{j \in J}\left(o_{\left[a_{j}, b_{j}\right]} \cap \mathbb{R}\right)=\left(\bigcup_{j \in J} o_{\left[a_{j}, b_{j}\right]}\right) \cap \mathbb{R}$	$U=\bigcup_{j \in J}\left\{x \in \mathbb{R} \mid a_{j}<x<b_{j}\right\}=\bigcup_{j \in J}\left(o_{\left[a_{j}, b_{j}\right]} \cap \mathbb{R}\right)=\left(\bigcup_{j \in J} o_{\left[a_{j}, b_{j}\right]}\right) \cap \mathbb{R}$