# A Template for Bachelor's Theses and Master's Theses

## Master's Thesis

Presented to the
Department of Economics at the
Rheinische Friedrich-Wilhelms-Universität Bonn

In Partial Fulfillment of the Requirements for the Degree of Master of Science (M.Sc.)

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Submitted in December 2020 by

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## 1 Introduction

"Most people can save a few dollars a day or even \$10 a day," she said. "That's doable. But if you say, 'Can you save \$300 a month or a couple of thousand dollars a year?' people will say, 'Whoa."'

Avoiding that "whoa," which is the hesitancy that can derail planning, is what consultants like Ms. Davidson are trying to do.

—New York Times, March 27, 2016

[Holger 1]
Commenting is on!
To switch it off, activate \PassOption-sToPackage {final}{changes in the master file.

This template uses the Times Roman typeface for the body text and headings. Times Roman is a serif typeface and was designed in 1931 by Stanley Morison. The page layout—the margins and the line spacing—is based on the design guidelines<sup>1</sup> of the examination office of the Department of Economics at the University of Bonn:

Die Bachelorarbeit darf höchstens einen Textumfang, inklusive Grafiken, Bilder, Formeln etc., von **20 [Masterarbeit: 40] einseitig bedruckten** DIN-A4-Seiten haben, wobei Inhaltsverzeichnis, Anhang und Literaturverzeichnis nicht mitzählen. ...

Es ist Papier im DIN-A4-Format zu benutzen. Verwenden Sie den Schrifttyp Times New Roman oder eine Schriftart der gleichen Kategorie (Serifen), die Schriftgröße 12, anderthalbfachen Zeilenabstand und Blocksatz. Die Seitenränder sollen links 3 cm sowie rechts, oben und unten 2 cm betragen.

[Holger 2]

This makes for an incredibly ugly layout. :-(But we follow the guidelines despite that. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look. This text should contain *all letters of the alphabet* and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

[Lou E. 1]
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"some"

[Lou E. 2]

Let us cite a few publications: Andersen, Harrison, Lau, and Rutström (2008), Andreoni and Sprenger (2012), Kőszegi and Szeidl (2013), and Balakrishnan, Haushofer, and Jakiela (2016). Andersen et al. (2008) once more. With the options set for BibLaTeX in the preamble, citations in the body text are automatically sorted chronologically—irrespective of the order of the "citekeys" in your input. Of course, entries are sorted alphabetically by author surname in the list of references.

<sup>1.</sup> https://www.vwlpamt.uni-bonn.de/pruefungsamt/pdfs/formulare/bachelorarbeitsmerkblatt-formalia and https://www.vwlpamt.uni-bonn.de/pruefungsamt/pdfs/formulare/masterarbeitsmerkblatt-formalia.

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[Holger 3]
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Some more references: See Sims (2003) and Gabaix (2014) for models of "rational inattention" or "goal-driven attention." See Bordalo, Gennaioli, and Shleifer (2012, 2013), Kőszegi and Szeidl (2013), Taubinsky (2014), and Bushong, Rabin, and Schwartzstein (2016) for models of "stimulus-driven attention."

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

In Section 2, we describe the design of our study. We present the data analysis and our results in Section 3. In Section 4, we discuss the plausibility of potential alternative explanations. Section 5 concludes.

## 2 Methods

In this section, we first present the design of the experiment (2.1) and derive behavioral predictions (2.2).

## 2.1 Design of the Main Experiment

#### 2.1.1 General Features

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ .

#### 2.1.2 More Specific Features

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<sup>2.</sup> Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look. This text should contain *all letters of the alphabet* and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.



**Figure 1.** Budget Sets  $C_{1:1}^{\mathrm{BAL},\,\mathrm{I}}$  and  $C_{1:n}^{\mathrm{UNBAL},\,\mathrm{I}}$ 



**Figure 2.** Budget Sets  $C_{1:1}^{\mathrm{BAL,\,II}}$  and  $C_{n:1}^{\mathrm{UNBAL,\,II}}$ 

*Notes:* For the values of B, R, and w that we used, see Section 2.1.4. The savings rate x is individuals' choice variable: they choose some  $x \in X = \{0, \frac{1}{100}, \frac{2}{100}, \dots, 1\}$  in each trial. The arrows indicate whether and in which direction payments at the respective payment dates change if x is increased.  $\sigma_{\epsilon}$ ,  $c^{\alpha}$ . This figure was taken from Dertwinkel-Kalt, Gerhardt, Riener, Schwerter, and Strang (2017).





**Figure 3.** Screenshots of a BAL $_{1:1}^{I}$  Decision (Top) and an UNBAL $_{1:8}^{I}$  Decision (Bottom) *Note:* This figure was taken from Dertwinkel-Kalt et al. (2017).

Figure 3 shows an exemplary decision screen with B = £11 and  $r \approx 15\%$  for both BAL $_{1:1}^{\text{I}}$  (upper panel) and UNBAL $_{1:8}^{\text{I}}$  (lower panel). Through a slider, subjects choose their preferred

 $x \in X$ . The slider position in Figure 3 indicates x = 0.5, i.e., the earliest payment is reduced by  $\in 5.50$ . Since  $r \approx 15\%$  in this example, this slider position amounts to  $\in 6.30$  that are paid at later payment dates. While these  $\in 6.30$  are paid in a single bank transfer on the latest payment date in BAL $_{1:1}^{I}$ , the amount is dispersed in equal parts over the last 8 payment dates in UNBAL $_{1:8}^{I}$ —i.e., 8 consecutive payments of  $\in 0.79.4$ 

#### 2.1.3 Some More Details

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

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<sup>3.</sup> The slider had no initial position—it appeared only after subjects first positioned the mouse cursor over the slider bar. This was done to avoid default effects.

<sup>4.</sup> We always rounded the second decimal place up so that the sum of the payments included in a dispersed payoff was always at least as great as the respective concentrated payoff.

- of the original language  $E = mc^2$ . There is no need for special contents, but the length of words should match the language.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ .
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#### 2.1.4 Procedure

Describe the sequence of events in your study. You could do this with the help of an enumerated list:

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#### 2.2 Predictions

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ .

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By discounted utility we understand any intertemporal utility function that (1) is time-separable and that (2) values a payment farther in the future at most as much as an equal-sized payment closer in the future. Importantly, the predictions derived below hold for all three frequently used types of discounting—exponential, hyperbolic, and quasi-hyperbolic.

In the following, we assume that individuals base their decisions on utility derived from receiving monetary payments  $c_t$  at various dates t. This is an assumption that is frequently made in experiments on intertemporal decision making. One way to justify this assumption is that individuals anticipate to consume the payments they receive within a short period around date t. Given that the maximum payment was below €20 and that any two payment dates were separated by at least two weeks, this assumption seems reasonable (see the arguments in favor of this view in Halevy, 2014). Kőszegi and Szeidl (2013) themselves make the same assumption of "money in the utility function": "in some applications we also assume that monetary transactions induce direct utility consequences, so that for instance an agent making a payment experiences an immediate utility loss. The idea that people experience monetary transactions as immediate utility is both intuitively compelling and supported in the literature: ... some evidence on individuals' attitudes toward money, such as narrow bracketing (...) and laboratory evidence on hyperbolic discounting (...), is difficult to explain without it." Last but not least, the papers by McClure,

letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift - not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift - not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

Laibson, Loewenstein, and Cohen (2004) and McClure, Ericson, Laibson, Loewenstein, and Cohen (2007) demonstrate that brain activation, as measured by functional magnetic resonance imaging, is similar for primary and monetary rewards. Additionally, we make the standard assumption that utility from money is increasing in its argument but not convex:  $u'(c_t) \ge 0$  and  $u''(c_t) \le 0$ .

#### 2.2.1 Discounted Utility

Individuals make their allocation decisions by comparing the aggregated consumption utility of each earnings sequence  $c \in C$ . Discounted utility assumes that the utility of each period enters overall utility additively. That is, utility derived from the payment to be received at future date t can be expressed as  $u_t(c_t) := D(t) u(c_t)$ . Here, D(t) denotes the individual's discount function for conversion of future utility into present utility. The discount function satisfies  $0 \le D(t)$  and  $D'(t) \le 0$ , such that a payment further in the future is valued at most as much as an equal-sized payment closer in the future.

The utility of earnings sequence c with payments  $c_t$  in periods  $t = 1, \dots, T$  is

$$U(c) = \sum_{t=1}^{T} u_t(c_t) = \sum_{t=1}^{T} D(t) u(c_t).$$
 (1)

Individuals choose how much to allocate to the different periods by maximizing their utility over all possible earnings sequences available within a given budget set C, see equation (1). We use the superscript  $^{\mathrm{DU}}$  to indicate decisions based on discounted utility.

A Subparagraph. And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.

<sup>6.</sup> Normalization such that  $D(t) \le 1$  is not necessary in our case. Provided that t is a metric time measure, where t = 0 stands for the present, examples are  $D(t) := \delta^t$  with some  $\delta > 0$  for exponential discounting and  $D(t) := (1 + \alpha t)^{-\gamma/\alpha}$  with some  $\alpha, \gamma > 0$  for generalized hyperbolic discounting.

 $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^n b}$ .

Another Subparagraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like* this gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain all letters of the alphabet and it should be written in of the original language.  $\sqrt[q]{a} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^n b}$ .

#### 2.2.2 Focus-Weighted Utility

In this section, we extend the model of discounted utility through "focus weights," as proposed by Kőszegi and Szeidl (2013). Period-t weights  $g_t$  scale period-t consumption utility  $u_t$ . Individuals are assumed to maximize focus-weighted utility, which is defined as follows:

$$\tilde{U}(\boldsymbol{c}, \boldsymbol{C}) := \sum_{t=1}^{T} g_t(\boldsymbol{C}) u_t(c_t).$$
 (2)

In contrast to discounted utility U(c), focus-weighted utility  $\tilde{U}(c, C)$  has two arguments: the earnings sequence c and the choice set C. The latter dependence is due to the weights  $g_t$ . These are given by a strictly increasing weighting function g that takes as its argument the difference between the maximum and the minimum attainable utility in period t over all possible earnings sequences in set C:

$$g_t(\mathbf{C}) := g[\Delta_t(\mathbf{C})] \quad \text{with} \quad \Delta_t(\mathbf{C}) := \max_{\mathbf{c} \in \mathbf{C}} u_t(c_t) - \min_{\mathbf{c} \in \mathbf{C}} u_t(c_t).$$
 (3)

If the underlying consumption utility function is characterized by discounted utility, then  $u_t(c_t) := D(t) u(c_t)$ . That is, focused thinkers put more weight on period t than on period t' if the discounted-utility distance between the best and worst alternative is larger for period t than for period t'.

A Subparagraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\sqrt[q]{a} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

Yet Another Subparagraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like* this gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain all letters of the alphabet and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^n b}$ .

#### 2.2.3 Hypotheses

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ . This gives rise to our first hypothesis:

**Hypothesis 1.** This environment can be used to clearly state your hypothesis and set them apart from the body text.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original

language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ . Based on this, we can state our second hypothesis:

**Hypothesis 2.** This environment can be used to clearly state your hypothesis and set them apart from the body text.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

### 3 Results

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ . With this, we can test our hypotheses.

## 3.1 Test of Hypothesis 1

Our first result supports Hypothesis 1. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\sqrt[q]{a} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ . The analysis we conducted to obtain

Table 1. An Example Table

Dependent variable	$\hat{d}$
Estimate	0.123*** (0.011)
Observations Subjects	750 250

*Notes:* Standard errors in parentheses, clustered on the subject level. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Result 1 is described in detail in Table 1. Let's reference a section, a subsection, and a figure from the appendices: Appendix C, Section A.2, Figure B.1.

**Result 1.** Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain all letters of the alphabet and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ .

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

## 3.2 Test of Hypothesis 2

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original

language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ . We thereby test Hypothesis 2.

**Result 2.** Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain all letters of the alphabet and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ .

Our second result provides evidence in support of Hypothesis 2. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look. This text should contain *all letters of the alphabet* and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

## 3.3 Heterogeneity

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{i=n} x_i = \frac{x_1 + x_2 + \dots + x_n}{n}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information

about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

$$\int_0^\infty e^{-\alpha x^2} dx = \frac{1}{2} \sqrt{\int_{-\infty}^\infty e^{-\alpha x^2}} dx \int_{-\infty}^\infty e^{-\alpha y^2} dy = \frac{1}{2} \sqrt{\frac{\pi}{\alpha}}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ .

$$\sum_{k=0}^{\infty} a_0 q^k = \lim_{n \to \infty} \sum_{k=0}^{n} a_0 q^k = \lim_{n \to \infty} a_0 \frac{1 - q^{n+1}}{1 - q} = \frac{a_0}{1 - q}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[n]{b} = \sqrt[n]{a^nb}$ .

$$x_{1,2} \ = \ \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \ = \ \frac{-p \pm \sqrt{p^2 - 4q}}{2}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original

language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[n]{\frac{a}{b}}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

$$\frac{\partial^2 \Phi}{\partial x^2} + \frac{\partial^2 \Phi}{\partial y^2} + \frac{\partial^2 \Phi}{\partial z^2} = \frac{1}{c^2} \frac{\partial^2 \Phi}{\partial t^2}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\sqrt[q]{a} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^nb}$ .

#### 3.4 Structural Estimation

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look. This text should contain *all letters of the alphabet* and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

$$\Sigma := \operatorname{Cov}(X) = \begin{bmatrix} \operatorname{Var}(X_1) & \cdots & \operatorname{Cov}(X_1, X_n) \\ \vdots & \ddots & \vdots \\ \operatorname{Cov}(X_n, X_1) & \cdots & \operatorname{Var}(X_n) \end{bmatrix}$$

## 4 Discussion

#### 4.1 Some Limitations

Let's reference some tables: Table 2 and Table 3. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look. This text should

Table 2. Points Awarded in Our Typeface Competition—Basic Formatting

	Utopia	Computer Modern	Charter	Times Roman	Palatino
Yoël	1	1	2	0	1
Çelik	2	0	2	1	0
Anità	1	2	1	2	0
Uğur	1	2	0	1	0
Håkan	1	0	2	0	1
Allison	2	0	1	2	1
Pía	1	0	2	1	0
David	1	0	2	1	1
Sum	10	5	12	8	4

contain *all letters of the alphabet* and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

## **4.2** Utility from Money

In deriving our predictions (Section 2.2), we assume that subjects base their decisions on utility derived from receiving monetary payments  $c_t$  at various dates t. We also make the standard assumption that utility from money is increasing in its argument but not convex, i.e.,  $u'(c_t) \ge 0$ 

Table 3. Points Awarded in Our Typeface Competition—More Sophisticated Formatting

	Utopia <sup>a</sup>	Computer Modern <sup>b</sup>	Charter <sup>c</sup>	Times Roman <sup>d</sup>	Palatino <sup>e</sup>
Yoël	1	1	2	0	1
Çelik	2	0	2	1	0
Anità	1	2	1	2	0
Uğur	1	2	0	1	0
Håkan	1	0	2	0	1
Allison	2	0	1	2	1
Pía	1	0	2	1	0
David	1	0	2	1	1
Sum	10	5	12	8	4

a \usepackage{fourier}

<sup>&</sup>lt;sup>b</sup> The LATEX standard serif font.

c \usepackage[charter]{mathdesign}

d \usepackage{newtxtext, newtxmath}

e \usepackage[sc]{mathpazo}

and  $u''(c_t) \le 0$ . Both assumptions are frequently made in studies on intertemporal decision making.

One way to justify the assumption of utility being based on money—rather than consumption—is that individuals anticipate to consume the payments that they receive at date t within a short period around t. Given that the maximum payment was below  $\in$ 20 and that any two payment dates were separated by at least two weeks, this seems reasonable (see the arguments in favor of this view in Halevy, 2014).

A second justification is consistency within the discipline: Halevy (2014) points out that "in the domain of risk and uncertainty ... preferences are often defined over payments." In line with this, Kőszegi and Szeidl (2013, p. 62) make the same assumption of "money in the utility function":

in some applications we also assume that monetary transactions induce *direct* utility consequences, so that for instance an agent making a payment experiences an immediate utility loss. The idea that people experience monetary transactions as immediate utility is both intuitively compelling and supported in the literature: ... some evidence on individuals' attitudes toward money, such as narrow bracketing (...) and laboratory evidence on hyperbolic discounting (...), is difficult to explain without it.

Last but not least, the papers by McClure, Laibson, et al. (2004) and McClure, Ericson, et al. (2007) demonstrate that brain activation, as measured by functional magnetic resonance imaging, is similar for primary and monetary rewards.

Let us now discuss the second assumption: that utility from money is nonconvex. We find that subjects allocate more money to the concentrated payoffs in the unbalanced than in the associated balanced budget sets—which we call concentration bias. One might argue that this relative preference for concentrated payoffs can be explained by the per-period utility function over money being convex.

Obtaining evidence on the shape of utility over money is nontrivial because it requires that at least two monetary amounts be compared with each other without the one clearly dominating the other. Thus, estimates of the curvature of the utility function over money can be obtained in two ways: the monetary amounts must be paid in different states of the world, i.e., comprise a lottery, or they have to be paid at different points in time. Both methods entail particular theoretical assumptions.

<sup>7.</sup> As a matter of fact, the latter was the motivation behind Samuelson (1937): "Under the following four assumptions, it is believed possible to arrive theoretically at a precise measure of the marginal utility of *money income*..." (p. 155; emphasis in the original).

Andersen et al. (2008) advocate the former approach and argue that when estimating time preference parameters, one should control for the curvature of the utility function through a measure of the curvature that is based on observed choices under risk. Their study and numerous other studies on risk attitudes consistently reveal that the vast majority of subjects is risk-averse even over small stakes. Hence, for the vast majority of subjects, utility over money is concave according to this methodology (ruling out probability weighting). Others, most notably Andreoni and Sprenger (2012), have argued that the degree of curvature measured via risky choices probably overstates the degree of curvature effective in intertemporal choices, but they also find that utility is concave (albeit close to linear). Given this unambiguous evidence from previous studies, it is implausible that our subjects exhibit convex utility over money.

## 5 Conclusion

Cite some more papers (Yaari, 1965; Warner and Pleeter, 2001; Davidoff, Brown, and Diamond, 2005; Benartzi, Previtero, and Thaler, 2011). Let's cite a book: Luce (1959). Let's cite a contribution to a collected volume: Harrison and Rutström (2008) and a collection (an edited volume) itself: Kagel and Roth (2016). Now let's cite presentations at conferences: Vosgerau, Bruyneel, Dhar, and Wertenbroch (2008) and Beute and Kort (2012). Attema, Bleichrodt, Gao, Huang, and Wakker (2016) propose a method for "measuring discounting without measuring utility".

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look. This text should contain *all letters of the alphabet* and it should be written in of the original language. There is no need for special contents, but the length of words should match the language.

<sup>8.</sup> The basic idea of their method is intriguingly simple: Imagine an individual who is indifferent between, say, Option A: \$10 today and Option B: \$10 in one year plus \$10 in two years. With a constant annual discount factor  $\delta$ , this indifference translates to  $u(\$10) = \delta u(\$10) + \delta^2 u(\$10)$ , so that u(\$10) cancels out, and  $\delta$  can be readily calculated as the solution to  $1 = \delta + \delta^2$ .

# **Appendix A Put More Complicated Derivations and Proofs Here**

## A.1 Appendix Subsection

This is the second paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place.  $\sin^2(\alpha) + \cos^2(\beta) = 1$ . If you read this text, you will get no information  $E = mc^2$ . Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text *like this* gives you information about the selected font, how the letters are written and an impression of the look.  $\sqrt[q]{a} \cdot \sqrt[q]{b} = \sqrt[q]{ab}$ . This text should contain *all letters of the alphabet* and it should be written in of the original language.  $\frac{\sqrt[q]{a}}{\sqrt[q]{b}} = \sqrt[q]{a}$ . There is no need for special contents, but the length of words should match the language.  $a\sqrt[q]{b} = \sqrt[q]{a^n b}$ .

- (1) First itemtext
  - a. First itemtext
    - i. First itemtext
    - ii. Second itemtext
    - iii. Last itemtext
    - iv. First itemtext
  - b. Second itemtext
  - c. Last itemtext
  - d. First itemtext
- (2) Second itemtext
- (3) Last itemtext
- (4) First itemtext

The typeset math below follows the ISO recommendations that only variables be set in italic. Note the use of upright shapes for "d," "e," and " $\pi$ ." (These are entered as \mathup{d}, \mathup{e}, and \mathup{\pi}, respectively.)

**Theorem 1 (Simplest form of the** *Central Limit Theorem*). Let  $X_1, X_2, ..., X_n$  be a sequence of i.i.d. random variables with mean 0 and variance 1 on a probability space  $(\Omega, \mathcal{F}, \mathbb{P})$ . Then

$$\mathbb{P}\left(\frac{X_1 + \dots + X_n}{\sqrt{n}} \le y\right) \to \Re(y) := \int_{-\infty}^y \frac{\mathrm{e}^{-v^2/2}}{\sqrt{2\pi}} \, \mathrm{d}v \quad as \ n \to \infty,$$

or, equivalently, letting  $S_n := \sum_{1}^{n} X_k$ ,

$$\mathbb{E} f(S_n/\sqrt{n}) \ \to \ \int_{-\infty}^{\infty} f(v) \frac{\mathrm{e}^{-v^2/2}}{\sqrt{2\pi}} \, \mathrm{d}v \quad \textit{as } n \to \infty, \textit{for every } f \in \mathrm{b}C(\mathbb{R}).$$

#### A.2 Salience

Salience theory (Bordalo, Gennaioli, and Shleifer, 2012, 2013) represents a behavioral model according to which the most distinctive features of the available alternatives receive a particularly large share of attention and are therefore over-weighted. More precisely, a particular attribute out of all attributes of an alternative becomes the more salient, the more it differs from that attribute's average level over all available alternatives.

Formally, alternatives are assumed to be uniquely characterized by the values they take in  $T \ge 1$  attributes (or, "dimensions"). Utility is assumed to be additively separable in attributes, and salience attaches a decision weight to each attribute of each good which indicates how salient the respective attribute is for that good. Suppose an agent chooses one alternative from some finite choice set C. Let t index the T different attributes, and let t index the t available alternatives. Let t denote the function which assigns utility to values in dimension t. Denote by t the level of attribute t of good t and define t is at the utility that dimension t of good t yields. Let t be the average utility level, across all t goods, of dimension t. The salience of each dimension of good t is determined by a symmetric and continuous salience function t0. That satisfies the following two properties:

(1) Ordering. Let  $\mu := \operatorname{sgn}(u_t^k - \overline{u}_t)$ . Then for any  $\epsilon, \epsilon' \ge 0$  with  $\epsilon + \epsilon' > 0$ , it holds that

$$\sigma(u_t^k + \mu \, \epsilon, \overline{u}_t - \mu \, \epsilon') > \sigma(u_t^k, \overline{u}_t). \tag{A.1}$$

(2) Diminishing sensitivity. For any  $u_t^k$ ,  $\overline{u}_t \ge 0$  and all  $\epsilon > 0$ , it holds that

$$\sigma(u_t^k + \epsilon, \overline{u}_t + \epsilon) < \sigma(u_t^k, \overline{u}_t). \tag{A.2}$$

Following the smooth salience characterization proposed in Bordalo, Gennaioli, and Shleifer (2012, p. 1255), each dimension t of good k receives weight  $\Delta^{-\sigma(u_t^k, \overline{u}_t)}$ , where  $\Delta \in (0, 1]$  is a constant that captures an agent's susceptibility to salience.  $\Delta = 1$  gives rise to a rational decision maker, and the smaller  $\Delta$ , the stronger is the salience bias. We call an agent with  $\Delta < 1$  a salient thinker.

A reference with a large number of authors is Henrich, Boyd, Bowles, Camerer, Fehr, et al. (2005).

## **Appendix B** Some Additional Figures



**Figure B.1.** Earnings Sequences Included in Choice List  $C_{\mathrm{CL}}^{\mathrm{BAL}}$ 

*Notes:* For the values of B, i, and w that we used see Section 2. Figure taken from Dertwinkel-Kalt et al. (2017).



**Figure B.2.** Earnings Sequences Included in Choice List  $C_{\mathrm{CL}}^{\mathrm{UNBAL,\,I}}$ 

*Notes:* For the values of B, i, and w that we used see Section 2. Figure taken from Dertwinkel-Kalt et al. (2017).



**Figure B.3.** Earnings Sequences Included in Choice List  $m{C}_{\mathrm{CL}}^{\mathrm{UNBAL,\,II}}$ 

*Notes:* For the values of B, i, and w that we used see Section 2. Figure taken from Dertwinkel-Kalt et al. (2017).

## **Appendix C** siunitx Example Tables

**Table C.1.** An Example of a Regression Table (Adapted from Gerhardt, Schildberg-Hörisch, and Willrodt, 2017). Never Forget to Mention the Dependent Variable!

	(1)	(2)	(3)	(4)	(5)
Treatment	-0.390	-0.228	-0.729*	-0.449*	-0.453**
	(+0.352)	(-0.205)	[+0.377]	[-0.245]	{+0.204}
Female	0.948***	0.061	0.188	0.305	0.385*
	(0.354)	(0.233)	(0.372)	(0.226)	(0.222)
Female × Treatment	0.169	0.251	0.892*	0.454	0.439
	(0.514)	(0.325)	(0.533)	(0.341)	(0.307)
Final high school grade	-0.101	0.013	0.076	0.117	0.039
-	(0.198)	(0.144)	(0.224)	(0.146)	(0.133)
Trait self-control	-0.016	0.002	-0.016	-0.000	-0.007
	(0.016)	(0.010)	(0.015)	(0.010)	(0.009)
Constant	2.357***	1.512***	-0.322	2.158***	1.437***
	(0.239)	(0.144)	(0.265)	(0.161)	(0.152)
Observations	303	289	295	304	1191
$R^2$	0.057	0.008	0.039	0.043	0.024
${\text{Treatment} \times (1 + \text{Female})}$	-0.221	0.023	0.163	0.004	-0.014
$p_F$ [Treatment × (1 + Female) = 0]	0.327	0.008	0.192	0.000	0.003

Notes: Dependent variable:  $m_{\sim}$ . Robust standard errors (cluster-corrected for column 5) in parentheses. \*\*\* p < 0.01, \*\*\* p < 0.05, \* p < 0.1. Missing observations (N < 308) due to exclusion of trials in which subjects behaved irrationally (i.e., chose a dominated option). The regressors Final high school grade and Trait self-control are mean-centered.

**Table C.2.** Figure Grouping via siunitx in a Table.

(1)	(2)	(3)
-0.100*	-0.10001*	-123456.444***
(2.871)	(2.87123)	[+50000.123]

**Table C.3.** Overview of the Choice Lists Presented to Subjects (Adapted from Gerhardt, Schildberg-Hörisch, and Willrodt, 2017).

		Alternative A				Alternative $\boldsymbol{B}$				
	$c_{A,1}$	$p_{A,1}$	$c_{A,2}$	$p_{A,2}$	C <sub><b>B</b>,1</sub>	<i>p</i> <sub><b>B</b>,1</sub>	C <b>B</b> ,2	<i>p</i> <sub><b>B</b>,2</sub>		
Choice List I: $risky/risky$ ( $x = \frac{1}{2}$	£22.00, <i>r</i> = €7	50, k = 6	£11.50; 25 ı	rows)						
Top row	€ 3.00	50%	€22.00	50%	€ 3.00	50%	€ 7.00	50%		
Center row	€ 3.00	50%	€22.00	50%	€ 9.00	50%	€13.00	50%		
Row with $m = 0$	€ 3.00	50%	€22.00	50%	€10.50	50%	€14.50	50%		
Bottom row	€ 3.00	50%	€22.00	50%	€15.00	50%	€19.00	50%		
Choice List II: safe/risky $(x = 0)$	£16.00, <i>r</i> = €5.0	00, k = <b>6</b>	£5.00; 19 rc	ows)						
Top row	€11.00	100%			€11.00	50%	€21.00	50%		
Center row	€11.00	100%			€ 6.50	50%	€16.50	50%		
Row with $m = 0$	€11.00	100%			€ 6.00	50%	€16.00	50%		
Bottom row	€11.00	100%			€ 2.00	50%	€12.00	50%		
Choice List III: "long shot" (x	= €14.00, r =	-€36.00	, <i>k</i> = €7.00	; 21 rows)	)					
Top row	€ 7.00	90%	€50.00	10%	€ 7.00	90%	€10.00	10%		
Row with $m = 0$	€ 7.00	90%	€50.00	10%	€11.00	90%	€14.00	10%		
Center row	€ 7.00	90%	€50.00	10%	€12.00	90%	€15.00	10%		
Bottom row	€ 7.00	90%	€50.00	10%	€17.00	90%	€20.00	10%		
Choice List IV: delayed payoffs	s(x = £18.00, r	= €6.00	0, k = &8.50	, paid in	one week; 20	rows)				
Top row	€ 9.50	50%	€12.00	50%	€ 9.50	50%	€24.00	50%		
Above-center row	€ 9.50	50%	€12.00	50%	€ 5.00	50%	€19.50	50%		
Below-center row	€ 9.50	50%	€12.00	50%	€ 4.50	50%	€19.00	50%		
Row with $m = 0$	€ 9.50	50%	€12.00	50%	€ 3.50	50%	€18.00	50%		
Bottom row	€ 9.50	50%	€12.00	50%	€ 0.00	50%	€14.50	50%		

## **Appendix D** Math Test Serif

#### **D.1** Overview Serif

Default:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ ;  $\sigma_{\epsilon}$ ,  $c^{\alpha}$ 

mathnormal:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathrm: aααbβGΓΓΡΠΣσ

mathup:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbf:  $a\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfit:  $a\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfup: aαbβGΓΓΡΠΣσ

Default:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ ;  $\sigma_{\epsilon}, c^{\alpha}$ 

mathnormal:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathrm:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathup: aααbβGΓΓΡΠΣσ

mathit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbf:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfup: αααbβGΓΓΡΠΣσ

Default:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ ;  $\sigma_{\epsilon},c^{\alpha}$ 

mathnormal:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathrm:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathup: aααbβGΓΓΡΠΣσ

mathit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbf:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfup:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

Default:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ ;  $\sigma_{\epsilon}, c^{\alpha}$ 

mathnormal:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathrm:  $\mathbf{a}\alpha\mathbf{a}\mathbf{b}\beta\mathbf{G}\Gamma\Gamma\mathbf{P}\Pi\Sigma\sigma$ 

mathup: aααbβGΓΓΡΠΣσ

mathit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbf:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfit:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

mathbfup:  $a\alpha\alpha b\beta G\Gamma\Gamma P\Pi\Sigma\sigma$ 

#### **D.2** Formulas Serif

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \zeta, \tau, \nu, \phi, \chi, \psi, \omega, F, A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega, F,$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \zeta, \tau, \upsilon, \phi, \chi, \psi, \omega, F, A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega, F,$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \zeta, \tau, \nu, \phi, \chi, \psi, \omega, F, A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega, F,$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \zeta, \tau, \upsilon, \phi, \chi, \psi, \omega, F, A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega, F,$ 

$$\alpha a > 0, \beta b + (3 \times 27), \Gamma G = 7 < 8, \lambda$$

$$\alpha a > 0, \beta b + (3 \times 27), \Gamma G = 7 < 8, \lambda$$

$$\lim_{v \to \infty} v(v) = \max_{s \in S} \{ s \pm 3\gamma + y - 1 \} = 4 \times 7$$
$$\hat{\beta} = (X'X)^{-1}X'y$$

$$\lim_{N \to \infty} \sum_{i=0}^{N} x^{i} = \min_{x \in \mathbb{R}} S(x)$$

$$\int_{-\infty}^{\infty} x f(x) \, \mathrm{d}x = \left(\frac{27}{2}\right)$$

 $\alpha a > 0, \beta b + (3 \times 27), \Gamma G = 7 < 8, \lambda$ 

$$\lim_{v \to \infty} v(v) = \max_{s \in S} \{ s \pm 3\gamma + y - 1 \} = 4 \times 7$$

$$\hat{\beta} = (X'X)^{-1} X' y$$

$$\lim_{N\to\infty}\sum_{i=0}^N x^i = \min_{x\in\mathbb{R}} S(x)$$

$$\int_{-\infty}^{\infty} x f(x) \, \mathrm{d}x = \left(\frac{27}{2}\right)$$

$$\alpha a > 0, \beta b + (3 \times 27), \Gamma G = 7 < 8, \lambda$$
  
 $\lim_{\nu \to \infty} v(\nu) = \max_{s \in S} \{ s \pm 3\gamma + y - 1 \} = 4 \times 7$   
 $\hat{\beta} = (X'X)^{-1}X'y$ 

$$\lim_{N \to \infty} \sum_{i=0}^{N} x^{i} = \min_{x \in \mathbb{R}} S(x)$$

$$\int_{-\infty}^{\infty} x f(x) \, \mathrm{d}x = \left(\frac{27}{2}\right)$$

$$\alpha a > 0, \beta b + (3 \times 27), \Gamma G = 7 < 8, \lambda$$

$$\lim_{v \to \infty} v(v) = \max_{s \in S} \{ s \pm 3\gamma + y - 1 \} = 4 \times 7$$

$$\hat{\beta} = (X'X)^{-1}X'y$$

$$\lim_{N\to\infty}\sum_{i=0}^N x^i = \min_{x\in\mathbb{R}} S(x)$$

$$\int_{-\infty}^{\infty} x f(x) \, \mathrm{d}x = \left(\frac{27}{2}\right)$$

## **D.3** Math Alphabets Serif

Default

0, 1, 2, 3, 4, 5, 6, 7, 8, 9,

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z,

a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z,

 $A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega,$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \nu, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \rho, \varsigma, \varphi,$ 

Math Normal (\mathnormal)

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, O, R, S, T, U, V, W, X, Y, Z,

a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z,

 $A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega,$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \nu, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \varrho, \varsigma, \varphi,$ 

Math Italic (\mathit)

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z,

a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z,

 $A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \nu, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \varrho, \varsigma, \varphi,$ 

#### Math Roman (\mathrm)

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z,

 $A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega,$ 

 $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \nu, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \varrho, \varsigma, \varphi,$ 

#### Math Bold (\mathbf)

0, 1, 2, 3, 4, 5, 6, 7, 8, 9,

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z,  $A, B, \Gamma, \Delta, E, Z, H, \Theta, I, K, \Lambda, M, N, \Xi, O, \Pi, P, \Sigma, T, \Upsilon, \Phi, X, \Psi, \Omega,$   $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, v, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \rho, \varsigma, \varphi,$ 

#### Caligraphic (\mathcal)

 $\mathcal{A}, \mathcal{B}, \mathcal{C}, \mathcal{D}, \mathcal{E}, \mathcal{F}, \mathcal{G}, \mathcal{H}, \mathcal{I}, \mathcal{J}, \mathcal{K}, \mathcal{L}, \mathcal{M}, \mathcal{N}, \mathcal{O}, \mathcal{P}, \mathcal{Q}, \mathcal{R}, \mathcal{S}, \mathcal{T}, \mathcal{U}, \mathcal{V}, \mathcal{W}, \mathcal{X}, \mathcal{Y}, \mathcal{Z}, \mathcal{C}, \mathcal{C}$ 

Script (\mathscr)

 $\mathcal{A}, \mathcal{B}, \mathcal{C}, \mathcal{D}, \mathcal{E}, \mathcal{F}, \mathcal{G}, \mathcal{H}, \mathcal{I}, \mathcal{J}, \mathcal{K}, \mathcal{L}, \mathcal{M}, \mathcal{N}, \mathcal{O}, \mathcal{P}, \mathcal{Q}, \mathcal{R}, \mathcal{F}, \mathcal{T}, \mathcal{U}, \mathcal{V}, \mathcal{W}, \mathcal{X}, \mathcal{Y}, \mathcal{Z}, \mathcal{Y}, \mathcal{Z}, \mathcal{Y}, \mathcal{Z}, \mathcal{Y}, \mathcal{Z}, \mathcal{Y}, \mathcal{Z}, \mathcal{Z}$ 

Fraktur (\mathfrak)

 $\mathfrak{A}, \mathfrak{B}, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}, \mathfrak{F}, \mathfrak{G}, \mathfrak{H}, \mathfrak{I}, \mathfrak{I}, \mathfrak{K}, \mathfrak{L}, \mathfrak{M}, \mathfrak{N}, \mathfrak{D}, \mathfrak{P}, \mathfrak{Q}, \mathfrak{R}, \mathfrak{S}, \mathfrak{X}, \mathfrak{U}, \mathfrak{B}, \mathfrak{W}, \mathfrak{X}, \mathfrak{Y}, \mathfrak{J}, \mathfrak{A}, \mathfrak{A}, \mathfrak{L}, \mathfrak{L}$ 

Blackboard Bold (\mathbb)

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z,

### **D.4** Character Sidebearings Serif

Default

$$|A| + |B| + |C| + |D| + |E| + |F| + |G| + |H| + |I| + |J| + |K| + |L| + |M| + |N| + |O| + |P| + |Q| + |R| + |S| + |T| + |U| + |V| + |W| + |X| + |Y| + |Z| + |a| + |b| + |c| + |d| + |e| + |f| + |g| + |h| + |i| + |j| + |k| + |l| + |m| + |a| + |o| + |p| + |q| + |r| + |s| + |t| + |u| + |v| + |w| + |x| + |y| + |z| + |A| + |B| + |T| + |\Delta| + |E| + |Z| + |H| + |\Theta| + |I| + |K| + |A| + |M| + |N| + |E| + |O| + |H| + |F| + |F|$$

#### Math Roman (\mathrm)

$$\begin{split} |A| + |B| + |C| + |D| + |E| + |F| + |G| + |H| + |I| + |J| + |K| + |L| + |M| + \\ |N| + |O| + |P| + |Q| + |R| + |S| + |T| + |U| + |V| + |W| + |X| + |Y| + |Z| + \\ |a| + |b| + |c| + |d| + |e| + |f| + |g| + |h| + |i| + |j| + |k| + |I| + |m| + \\ |n| + |o| + |p| + |q| + |r| + |s| + |t| + |u| + |v| + |w| + |x| + |y| + |z| + \\ |A| + |B| + |\Gamma| + |\Delta| + |E| + |Z| + |H| + |\Theta| + |I| + |K| + |A| + |M| + \\ |N| + |\Xi| + |O| + |\Pi| + |P| + |\Sigma| + |T| + |Y| + |\Phi| + |X| + |\Psi| + |\Omega| + \\ \end{split}$$

Math Bold (\mathbf)

$$|A| + |B| + |C| + |D| + |E| + |F| + |G| + |H| + |I| + |J| + |K| + |L| + |M| + |N| + |O| + |P| + |Q| + |R| + |S| + |T| + |U| + |V| + |W| + |X| + |Y| + |Z| + |A| + |B| + |C| + |A| + |A|$$

Math Calligraphic (\mathcal)

$$|\mathcal{A}| + |\mathcal{B}| + |\mathcal{C}| + |\mathcal{D}| + |\mathcal{E}| + |\mathcal{F}| + |\mathcal{G}| + |\mathcal{H}| + |\mathcal{I}| + |\mathcal{J}| + |\mathcal{K}| + |\mathcal{L}| + |\mathcal{M}| + |\mathcal{N}| + |\mathcal{O}| + |\mathcal{P}| + |\mathcal{Q}| + |\mathcal{R}| + |\mathcal{S}| + |\mathcal{T}| + |\mathcal{U}| + |\mathcal{V}| + |\mathcal{W}| + |\mathcal{X}| + |\mathcal{Y}| + |\mathcal{Z}| + |\mathcal{Y}| + |$$

### **D.5** Superscript Positioning Serif

Default

$$A^{2} + B^{2} + C^{2} + D^{2} + E^{2} + F^{2} + G^{2} + H^{2} + I^{2} + J^{2} + K^{2} + L^{2} + M^{2} + N^{2} + O^{2} + P^{2} + Q^{2} + R^{2} + S^{2} + T^{2} + U^{2} + V^{2} + W^{2} + X^{2} + Y^{2} + Z^{2} + A^{2} + b^{2} + c^{2} + d^{2} + e^{2} + f^{2} + g^{2} + h^{2} + i^{2} + j^{2} + k^{2} + l^{2} + m^{2} + N^{2} + o^{2} + p^{2} + q^{2} + r^{2} + s^{2} + t^{2} + u^{2} + v^{2} + w^{2} + x^{2} + y^{2} + z^{2} + A^{2} + B^{2} + \Gamma^{2} + \Delta^{2} + E^{2} + Z^{2} + H^{2} + \Theta^{2} + I^{2} + K^{2} + \Lambda^{2} + M^{2} + N^{2} + E^{2} + O^{2} + \Pi^{2} + P^{2} + E^{2} + T^{2} + T^{2} + \Phi^{2} + X^{2} + \Psi^{2} + Q^{2} + \Omega^{2} + \Omega^{2$$

Math Roman (\mathrm)

$$\begin{split} A^2 + B^2 + C^2 + D^2 + E^2 + F^2 + G^2 + H^2 + I^2 + J^2 + K^2 + L^2 + M^2 + \\ N^2 + O^2 + P^2 + Q^2 + R^2 + S^2 + T^2 + U^2 + V^2 + W^2 + X^2 + Y^2 + Z^2 + \\ a^2 + b^2 + c^2 + d^2 + e^2 + f^2 + g^2 + h^2 + i^2 + j^2 + k^2 + I^2 + m^2 + \\ n^2 + o^2 + p^2 + q^2 + r^2 + s^2 + t^2 + u^2 + v^2 + w^2 + x^2 + y^2 + z^2 + \\ A^2 + B^2 + \Gamma^2 + \Delta^2 + E^2 + Z^2 + H^2 + \Theta^2 + I^2 + K^2 + \Lambda^2 + M^2 + \\ N^2 + \Xi^2 + O^2 + \Pi^2 + P^2 + \Sigma^2 + T^2 + \Upsilon^2 + \Phi^2 + X^2 + \Psi^2 + \Omega^2 + \\ \end{split}$$

Math Bold (\mathbf)

$$A^{2} + B^{2} + C^{2} + D^{2} + E^{2} + F^{2} + G^{2} + H^{2} + I^{2} + J^{2} + K^{2} + L^{2} + M^{2} + N^{2} + O^{2} + P^{2} + Q^{2} + R^{2} + S^{2} + T^{2} + U^{2} + V^{2} + W^{2} + X^{2} + Y^{2} + Z^{2} + A^{2} + b^{2} + c^{2} + d^{2} + e^{2} + f^{2} + g^{2} + h^{2} + i^{2} + j^{2} + k^{2} + l^{2} + m^{2} + n^{2} + o^{2} + p^{2} + q^{2} + r^{2} + s^{2} + t^{2} + u^{2} + v^{2} + w^{2} + x^{2} + y^{2} + z^{2} + A^{2} + B^{2} + \Gamma^{2} + \Delta^{2} + E^{2} + Z^{2} + H^{2} + \Theta^{2} + I^{2} + K^{2} + \Lambda^{2} + M^{2} + N^{2} + \Xi^{2} + O^{2} + \Pi^{2} + P^{2} + \Sigma^{2} + T^{2} + Y^{2} + \Phi^{2} + X^{2} + \Psi^{2} + \Omega^{2} + \Omega^{2$$

Math Calligraphic (\mathcal)

$$\mathcal{A}^2 + \mathcal{B}^2 + \mathcal{C}^2 + \mathcal{D}^2 + \mathcal{E}^2 + \mathcal{F}^2 + \mathcal{G}^2 + \mathcal{H}^2 + \mathcal{I}^2 + \mathcal{J}^2 + \mathcal{K}^2 + \mathcal{L}^2 + \mathcal{M}^2 + \mathcal{N}^2 + \mathcal{O}^2 + \mathcal$$

### **D.6** Subscript Positioning Serif

Default

$$A_{i} + B_{i} + C_{i} + D_{i} + E_{i} + F_{i} + G_{i} + H_{i} + I_{i} + J_{i} + K_{i} + L_{i} + M_{i} + N_{i} + O_{i} + P_{i} + Q_{i} + R_{i} + S_{i} + T_{i} + U_{i} + V_{i} + W_{i} + X_{i} + Y_{i} + Z_{i} + A_{i} + A_{i$$

Math Roman (\mathrm)

$$\begin{aligned} &A_{i} + B_{i} + C_{i} + D_{i} + E_{i} + F_{i} + G_{i} + H_{i} + I_{i} + J_{i} + K_{i} + L_{i} + M_{i} + \\ &N_{i} + O_{i} + P_{i} + Q_{i} + R_{i} + S_{i} + T_{i} + U_{i} + V_{i} + W_{i} + X_{i} + Y_{i} + Z_{i} + \\ &a_{i} + b_{i} + c_{i} + d_{i} + e_{i} + f_{i} + g_{i} + h_{i} + i_{i} + j_{i} + k_{i} + l_{i} + m_{i} + \\ &n_{i} + o_{i} + p_{i} + q_{i} + r_{i} + s_{i} + t_{i} + u_{i} + v_{i} + w_{i} + x_{i} + y_{i} + z_{i} + \\ &A_{i} + B_{i} + \Gamma_{i} + \Delta_{i} + E_{i} + Z_{i} + H_{i} + \Theta_{i} + I_{i} + K_{i} + \Lambda_{i} + M_{i} + \\ &N_{i} + \Xi_{i} + O_{i} + \Pi_{i} + P_{i} + \Sigma_{i} + T_{i} + Y_{i} + \Phi_{i} + X_{i} + \Psi_{i} + \Omega_{i} + \\ \end{aligned}$$

Math Bold (\mathbf)

$$A_{i} + B_{i} + C_{i} + D_{i} + E_{i} + F_{i} + G_{i} + H_{i} + I_{i} + J_{i} + K_{i} + L_{i} + M_{i} + N_{i} + O_{i} + P_{i} + Q_{i} + R_{i} + S_{i} + T_{i} + U_{i} + V_{i} + W_{i} + X_{i} + Y_{i} + Z_{i} + a_{i} + b_{i} + c_{i} + d_{i} + e_{i} + f_{i} + g_{i} + h_{i} + i_{i} + j_{i} + k_{i} + l_{i} + m_{i} + n_{i} + o_{i} + p_{i} + q_{i} + r_{i} + s_{i} + t_{i} + u_{i} + v_{i} + w_{i} + x_{i} + y_{i} + z_{i} + A_{i} + B_{i} + \Gamma_{i} + A_{i} + E_{i} + Z_{i} + H_{i} + \Theta_{i} + I_{i} + K_{i} + A_{i} + M_{i} + N_{i} + \Xi_{i} + O_{i} + H_{i} + P_{i} + \Sigma_{i} + T_{i} + Y_{i} + \Phi_{i} + X_{i} + \Psi_{i} + \Omega_{i} + \Omega_{i$$

Math Calligraphic (\mathcal)

$$\mathcal{A}_i + \mathcal{B}_i + C_i + \mathcal{D}_i + \mathcal{E}_i + \mathcal{F}_i + \mathcal{G}_i + \mathcal{H}_i + I_i + \mathcal{J}_i + \mathcal{K}_i + \mathcal{L}_i + \mathcal{M}_i + \mathcal{N}_i + \mathcal{O}_i + \mathcal{P}_i + \mathcal{Q}_i + \mathcal{R}_i + \mathcal{S}_i + \mathcal{T}_i + \mathcal{U}_i + \mathcal{V}_i + \mathcal{W}_i + \mathcal{X}_i + \mathcal{Y}_i + \mathcal{Z}_i + \mathcal{V}_i + \mathcal{V}_i$$

### **D.7** Accent Positioning Serif

Default

$$\hat{0} + \hat{1} + \hat{2} + \hat{3} + \hat{4} + \hat{5} + \hat{6} + \hat{7} + \hat{8} + \hat{9} + \\ \hat{A} + \hat{B} + \hat{C} + \hat{D} + \hat{E} + \hat{F} + \hat{G} + \hat{H} + \hat{I} + \hat{J} + \hat{K} + \hat{L} + \hat{M} + \\ \hat{N} + \hat{O} + \hat{P} + \hat{Q} + \hat{R} + \hat{S} + \hat{T} + \hat{U} + \hat{V} + \hat{W} + \hat{X} + \hat{Y} + \hat{Z} + \\ \hat{a} + \hat{b} + \hat{c} + \hat{d} + \hat{e} + \hat{f} + \hat{g} + \hat{h} + \hat{i} + \hat{j} + \hat{k} + \hat{l} + \hat{m} + \\ \hat{n} + \hat{o} + \hat{p} + \hat{q} + \hat{r} + \hat{s} + \hat{t} + \hat{u} + \hat{v} + \hat{w} + \hat{x} + \hat{y} + \hat{z} + \\ \hat{A} + \hat{B} + \hat{\Gamma} + \hat{\Delta} + \hat{E} + \hat{Z} + \hat{H} + \hat{\Theta} + \hat{I} + \hat{K} + \hat{\Lambda} + \hat{M} + \\ \hat{N} + \hat{z} + \hat{O} + \hat{\Pi} + \hat{P} + \hat{\Sigma} + \hat{T} + \hat{\Upsilon} + \hat{\Phi} + \hat{X} + \hat{\Psi} + \hat{Q} + \\ \hat{\alpha} + \hat{\beta} + \hat{\gamma} + \hat{\delta} + \hat{\epsilon} + \hat{\xi} + \hat{\eta} + \hat{\theta} + \hat{t} + \hat{\kappa} + \hat{\lambda} + \hat{\mu} + \\ \hat{v} + \hat{\xi} + \hat{o} + \hat{\pi} + \hat{\rho} + \hat{\sigma} + \hat{\tau} + \hat{v} + \hat{\phi} + \hat{\chi} + \hat{\psi} + \hat{\omega} + \\ \hat{\varepsilon} + \hat{\vartheta} + \hat{\varpi} + \hat{\varrho} + \hat{\varsigma} + \hat{\varsigma} + \hat{\varphi} +$$

Math Italic (\mathit)

$$\hat{0} + \hat{1} + \hat{2} + \hat{3} + \hat{4} + \hat{5} + \hat{6} + \hat{7} + \hat{8} + \hat{9} + \\ \hat{A} + \hat{B} + \hat{C} + \hat{D} + \hat{E} + \hat{F} + \hat{G} + \hat{H} + \hat{1} + \hat{J} + \hat{K} + \hat{L} + \hat{M} + \\ \hat{N} + \hat{O} + \hat{P} + \hat{Q} + \hat{R} + \hat{S} + \hat{T} + \hat{U} + \hat{V} + \hat{W} + \hat{X} + \hat{Y} + \hat{Z} + \\ \hat{a} + \hat{b} + \hat{c} + \hat{d} + \hat{e} + \hat{f} + \hat{g} + \hat{h} + \hat{i} + \hat{j} + \hat{k} + \hat{l} + \hat{m} + \hat{\ell} + \hat{\wp} + \hat{i} + \hat{j} + \hat{i} \\ \hat{n} + \hat{o} + \hat{p} + \hat{q} + \hat{r} + \hat{s} + \hat{t} + \hat{u} + \hat{v} + \hat{w} + \hat{x} + \hat{y} + \hat{z} + \\ \hat{A} + \hat{B} + \hat{\Gamma} + \hat{A} + \hat{E} + \hat{Z} + \hat{H} + \hat{\Theta} + \hat{I} + \hat{K} + \hat{A} + \hat{M} + \\ \hat{N} + \hat{z} + \hat{O} + \hat{\Pi} + \hat{P} + \hat{z} + \hat{T} + \hat{T} + \hat{\Phi} + \hat{X} + \hat{\Psi} + \hat{Q} + \\ \hat{\alpha} + \hat{\beta} + \hat{\gamma} + \hat{\delta} + \hat{\epsilon} + \hat{\xi} + \hat{\eta} + \hat{\theta} + \hat{i} + \hat{\kappa} + \hat{\lambda} + \hat{\mu} + \\ \hat{v} + \hat{\xi} + \hat{o} + \hat{\pi} + \hat{\rho} + \hat{\sigma} + \hat{\tau} + \hat{\tau} + \hat{v} + \hat{\phi} + \hat{\chi} + \hat{\psi} + \hat{\omega} + \\ \hat{\epsilon} + \hat{\vartheta} + \hat{\varpi} + \hat{\varrho} + \hat{\varsigma} + \hat{\varsigma} + \hat{\varsigma} + \hat{\varsigma} + \\ \hat{\varepsilon} + \hat{\vartheta} + \hat{\varpi} + \hat{\varrho} + \hat{\varsigma} + \hat{\varsigma} + \hat{\varsigma} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varsigma} + \hat{\varsigma} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varsigma} + \hat{\varsigma} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varsigma} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \hat{\varphi} + \\ \hat{\varphi} + \\ \hat{\varphi} + \\ \hat{\varphi} + \\ \hat{\varphi} + \\ \hat{\varphi} + \hat{\varphi} +$$

Math Roman (\mathrm)

$$\hat{0} + \hat{1} + \hat{2} + \hat{3} + \hat{4} + \hat{5} + \hat{6} + \hat{7} + \hat{8} + \hat{9} + \\ \hat{A} + \hat{B} + \hat{C} + \hat{D} + \hat{E} + \hat{F} + \hat{G} + \hat{H} + \hat{I} + \hat{J} + \hat{K} + \hat{L} + \hat{M} + \\ \hat{N} + \hat{O} + \hat{P} + \hat{Q} + \hat{R} + \hat{S} + \hat{T} + \hat{U} + \hat{V} + \hat{W} + \hat{X} + \hat{Y} + \hat{Z} + \\ \hat{a} + \hat{b} + \hat{c} + \hat{d} + \hat{e} + \hat{f} + \hat{g} + \hat{h} + \hat{i} + \hat{j} + \hat{k} + \hat{I} + \hat{m} + \\ \hat{n} + \hat{o} + \hat{p} + \hat{q} + \hat{r} + \hat{s} + \hat{t} + \hat{u} + \hat{v} + \hat{w} + \hat{x} + \hat{y} + \hat{z} + \\ \hat{A} + \hat{B} + \hat{\Gamma} + \hat{\Delta} + \hat{E} + \hat{Z} + \hat{H} + \hat{\Theta} + \hat{I} + \hat{K} + \hat{\Lambda} + \hat{M} + \\ \hat{N} + \hat{\Xi} + \hat{O} + \hat{\Pi} + \hat{P} + \hat{\Sigma} + \hat{T} + \hat{Y} + \hat{\Phi} + \hat{X} + \hat{\Psi} + \hat{Q} + \\ \hat{A} + \hat{B} + \hat{C} +$$

Math Bold (\mathbf)

$$\hat{0} + \hat{1} + \hat{2} + \hat{3} + \hat{4} + \hat{5} + \hat{6} + \hat{7} + \hat{8} + \hat{9} + \\ \hat{A} + \hat{B} + \hat{C} + \hat{D} + \hat{E} + \hat{F} + \hat{G} + \hat{H} + \hat{I} + \hat{J} + \hat{K} + \hat{L} + \hat{M} + \\ \hat{N} + \hat{O} + \hat{P} + \hat{Q} + \hat{R} + \hat{S} + \hat{T} + \hat{U} + \hat{V} + \hat{W} + \hat{X} + \hat{Y} + \hat{Z} + \\ \hat{a} + \hat{b} + \hat{c} + \hat{d} + \hat{e} + \hat{f} + \hat{g} + \hat{h} + \hat{i} + \hat{j} + \hat{k} + \hat{I} + \hat{m} + \\ \hat{n} + \hat{o} + \hat{p} + \hat{q} + \hat{r} + \hat{s} + \hat{t} + \hat{u} + \hat{v} + \hat{w} + \hat{x} + \hat{y} + \hat{z} + \\ \hat{A} + \hat{B} + \hat{\Gamma} + \hat{A} + \hat{E} + \hat{Z} + \hat{H} + \hat{\Theta} + \hat{I} + \hat{K} + \hat{A} + \hat{M} + \\ \hat{N} + \hat{\Xi} + \hat{O} + \hat{H} + \hat{P} + \hat{\Sigma} + \hat{T} + \hat{\Upsilon} + \hat{\Phi} + \hat{X} + \hat{\Psi} + \hat{Q} +$$

Math Calligraphic (\mathcal)

$$\hat{\mathcal{A}} + \hat{\mathcal{B}} + \hat{\mathcal{C}} + \hat{\mathcal{D}} + \hat{\mathcal{E}} + \hat{\mathcal{F}} + \hat{\mathcal{G}} + \hat{\mathcal{H}} + \hat{\mathcal{I}} + \hat{\mathcal{J}} + \hat{\mathcal{K}} + \hat{\mathcal{L}} + \hat{\mathcal{M}} + \hat{\mathcal{N}} + \hat{\mathcal{O}} + \hat{\mathcal{P}} + \hat{\mathcal{Q}} + \hat{\mathcal{R}} + \hat{\mathcal{S}} + \hat{\mathcal{T}} + \hat{\mathcal{U}} + \hat{\mathcal{V}} + \hat{\mathcal{W}} + \hat{\mathcal{X}} + \hat{\mathcal{Y}} + \hat{\mathcal{Y}} + \hat{\mathcal{Z}} + \hat{\mathcal{Y}} + \hat{\mathcal{$$

### **D.8** Differentials Serif

$$\begin{split} \partial A + \partial B + \partial C + \partial D + \partial E + \partial F + \partial G + \partial H + \partial I + \partial J + \partial K + \partial L + \partial M + \partial N + \partial O + \partial P + \partial Q + \partial R + \partial S + \partial T + \partial U + \partial V + \partial W + \partial X + \partial Y + \partial Z + \partial A + \partial b + \partial c + \partial d + \partial e + \partial f + \partial g + \partial h + \partial i + \partial j + \partial k + \partial l + \partial m + \partial n + \partial o + \partial p + \partial q + \partial r + \partial s + \partial t + \partial u + \partial v + \partial w + \partial x + \partial y + \partial z + \partial A + \partial B + \partial \Gamma + \partial \Delta + \partial E + \partial Z + \partial H + \partial \Theta + \partial I + \partial K + \partial \Lambda + \partial M + \partial N + \partial \Xi + \partial O + \partial \Pi + \partial P + \partial \Sigma + \partial T + \partial \Upsilon + \partial \Phi + \partial X + \partial \Psi + \partial \Omega + \partial A + \partial$$

### **D.9** Slash Kerning Serif

$$1/A + 1/B + 1/C + 1/D + 1/E + 1/F + 1/G + 1/H + 1/I + 1/J + 1/K + 1/L + 1/M + 1/N + 1/O + 1/P + 1/Q + 1/R + 1/S + 1/T + 1/U + 1/V + 1/W + 1/X + 1/Y + 1/Z + 1/a + 1/b + 1/c + 1/d + 1/e + 1/f + 1/g + 1/h + 1/i + 1/j + 1/k + 1/l + 1/m + 1/n + 1/o + 1/p + 1/q + 1/r + 1/s + 1/t + 1/u + 1/v + 1/w + 1/x + 1/y + 1/z + 1/A + 1/B + 1/\Gamma + 1/\Delta + 1/E + 1/Z + 1/H + 1/\Theta + 1/I + 1/K + 1/\Lambda + 1/M + 1/N + 1/E + 1/O + 1/\Pi + 1/P + 1/E + 1/T + 1/T$$

 $A/2 + B/2 + C/2 + D/2 + E/2 + F/2 + G/2 + H/2 + I/2 + J/2 + K/2 + L/2 + M/2 + N/2 + O/2 + P/2 + Q/2 + R/2 + S/2 + T/2 + U/2 + V/2 + W/2 + X/2 + Y/2 + Z/2 + a/2 + b/2 + c/2 + d/2 + e/2 + f/2 + g/2 + h/2 + i/2 + j/2 + k/2 + l/2 + m/2 + n/2 + o/2 + p/2 + q/2 + r/2 + s/2 + t/2 + u/2 + v/2 + w/2 + x/2 + y/2 + z/2 + A/2 + B/2 + \Gamma/2 + A/2 + E/2 + Z/2 + H/2 + \Theta/2 + I/2 + K/2 + A/2 + M/2 + N/2 + E/2 + O/2 + H/2 + P/2 + E/2 + T/2 + T/2 + P/2 + X/2 + P/2 + Q/2 + W/2 + W/2$ 

### **D.10** (Big) Operators Serif

$$\sum_{i=1}^{n} x^{n} \prod_{i=1}^{n} x^{n} \coprod_{i=1}^{n} x^{n} \int_{i=1}^{n} x^{n} \oint_{i=1}^{n} x^{n}$$

$$\otimes_{i=1}^{n} x^{n} \bigoplus_{i=1}^{n} x^{n} \bigoplus_{i=1}^{n} x^{n} \bigwedge_{i=1}^{n} x^{n} \bigvee_{i=1}^{n} x^{n} \bigoplus_{i=1}^{n} x^{n} \bigcup_{i=1}^{n} x^{n} \bigcap_{i=1}^{n} x^{n} \coprod_{i=1}^{n} x^{n}$$

$$\sum_{i=1}^{n} x^{n} \prod_{i=1}^{n} x^{n} \coprod_{i=1}^{n} x^{n} \int_{i=1}^{n} x^{n} \oint_{i=1}^{n} x^{n}$$

$$\bigotimes_{i=1}^{n} x^{n} \bigoplus_{i=1}^{n} x^{n} \bigvee_{i=1}^{n} x^{n} \bigvee_{i=1}^{n} x^{n} \bigoplus_{i=1}^{n} x^{n} \bigcup_{i=1}^{n} x^{n}$$

$$\bigotimes_{i=1}^{n} x^{n} \bigoplus_{i=1}^{n} x^{n} \bigvee_{i=1}^{n} x^{n} \bigvee_{i=1}^{n} x^{n} \bigvee_{i=1}^{n} x^{n} \bigcup_{i=1}^{n} x^{n} \bigcup_{i=1}^{n} x^{n}$$

### **D.11 Radicals Serif**

$$\sqrt{x+y} \qquad \sqrt{x^2+y^2} \qquad \sqrt{x_i^2+y_j^2} \qquad \sqrt{\left(\frac{\cos x}{2}\right)} \qquad \sqrt{\left(\frac{\sin x}{2}\right)}$$

$$\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{x+y}}}}}$$

# **D.12** Over- and Underbraces Serif

$$x = x + y = x^2 + y^2 = x^2 + y^2 = x = x + y = x_i + y_j = x^2 + y^2_j$$

### **D.13** Normal and Wide Accents Serif

$$\dot{x}$$
  $\ddot{x}$   $\ddot{x}$ 

# **D.14** Long Arrows Serif



# D.15 Left and Right Delimiters Serif

$$-(f) - - [f] - - \lfloor f \rfloor - - \lceil f \rceil - - \langle f \rangle - - \{f\} -$$

Using \left and \right.

$$-(f) - -[f] - -\lfloor f \rfloor - -\lceil f \rceil - -\langle f \rangle - -\{f\} -$$

$$-)f(--]f[--/f/--\backslash f\backslash --/f\backslash --\backslash f/-$$

# D.16 Big-g-g Delimiters Serif

### **D.17** Binary Operators Serif

$x \pm y$	\pm	$x \cap y$	\cap	$x \diamond y$	\diamond	$x \oplus y$	\oplus
$x \mp y$	\mp	$x \cup y$	\cup	$x \triangle y$	\bigtriangleup	$x \ominus y$	\ominus
$x \times y$	\times	$x \uplus y$	\uplus	$x \nabla y$	\bigtriangledown	$x \otimes y$	\otimes
$x \div y$	\div	$x \sqcap y$	\sqcap	$x \triangleleft y$	\triangleleft	$x \oslash y$	\oslash
x * y	\ast	$x \sqcup y$	\sqcup	$x \triangleright y$	\triangleright	$x \odot y$	\odot
$x \star y$	\star	$x \vee y$	\vee	$x \triangleleft y$	<b>\lhd</b>	$x \bigcirc y$	\bigcirc
$x \circ y$	\circ	$x \wedge y$	\wedge	$x \triangleright y$	\rhd	$x \dagger y$	\dagger
$x \bullet y$	\bullet	$x \setminus y$	\setminus	$x \leq y$	\unlhd	$x \ddagger y$	\ddagger
$x \cdot y$	\cdot	$x \wr y$	\wr	$x \trianglerighteq y$	\unrhd	x§ $y$	<b>\S</b>
x + y	+	x - y	-	$x \coprod y$	\amalg	$x \P y$	\P

### **D.18 Relations Serif**

```
x \leq y
         \leq
                                                                              x \models y
                                                                                         \models
                            x \geq y
                                      \geq
                                                        x \equiv y
                                                                  \equiv
         \prec
                                      \succ
                                                                              x \perp y
x < y
                            x > y
                                                        x \sim y
                                                                  \sim
                                                                                         \perp
x \leq y
         \preceq
                            x \geq y
                                      \succeq
                                                        x \simeq y
                                                                  \simeq
                                                                               x \mid y
                                                                                         \mid
         \11
                                                        x \times y \setminus \mathsf{asymp}
                                                                              x \parallel y
                                                                                         \parallel
x \ll y
                            x \gg y
                                     \gg
x \subset y
         \subset
                                      \supset
                                                                  \approx
                                                                              x \bowtie y
                                                                                         \bowtie
                            x\supset y
                                                        x \approx y
x \subseteq y
          \subseteq
                            x \supseteq y
                                      \supseteq
                                                                  \cong
                                                                                         \Join
                                                        x \cong y
                                                                              x\bowtie y
x \sqsubset y
         \sqsubset
                            x \supset y
                                      \sqsupset
                                                        x \neq y
                                                                  \neq
                                                                              x \smile y
                                                                                         \smile
         \sqsubseteq x \supseteq y
                                      \sqsupseteq x \doteq y
                                                                  \doteq
                                                                                         \frown
x \sqsubseteq y
                                                                              x \frown y
                                      \ni
x \in y
         \in
                            x \ni y
                                                        x \propto y
                                                                  \propto
                                                                              x = y
                                                                                         =
         \vdash
                            x \dashv y
                                      \dashv
x \vdash y
                                                        x < y
                                                                  <
                                                                               x > y
                                                                                         >
x:y
```

#### **D.19 Punctuation Serif**

```
x, y , x; y ; x: y \colon x. y \ldotp x \cdot y \cdotp
```

#### D.20 Arrows Serif

```
\longleftarrow
           \leftarrow
                                                                                        x \uparrow y
                                                                                                   \uparrow
x \leftarrow y
                                          \Longleftarrow
x \Leftarrow y
           \Leftarrow
                                                                                        x \uparrow y
                                                                                                   \Uparrow
                                          x \longleftarrow y
                                                                                                   \downarrow
           \rightarrow
                                          x \longrightarrow y
                                                        \longrightarrow
                                                                                        x \downarrow y
x \rightarrow y
           \Rightarrow
                                                        \Longrightarrow
                                                                                        x \downarrow y
                                                                                                   \Downarrow
x \Rightarrow y
                                          x \Longrightarrow y
                                                       \longleftrightarrow
           \leftrightarrow
                                                                                        x \uparrow y
                                                                                                   \updownarrow
x \leftrightarrow y
                                          x \longleftrightarrow y
           \Leftrightarrow
                                                        \Longleftrightarrow
                                                                                        x \updownarrow y
x \Leftrightarrow y
                                          x \Longleftrightarrow y
                                                                                                   \Updownarrow
x \mapsto y
           \mapsto
                                          x \longmapsto y
                                                        \longmapsto
                                                                                        x \nearrow y \setminus \text{nearrow}
x \leftarrow y
           \hookleftarrow
                                          x \hookrightarrow y
                                                        \hookrightarrow
                                                                                        x \searrow y
                                                                                                   \searrow
x \leftarrow y
           \leftharpoonup
                                                        \rightharpoonup
                                                                                        x \swarrow y
                                          x \rightharpoonup y
                                                                                                   \swarrow
           \leftharpoondown
                                                        \rightharpoondown
                                                                                        x \setminus y
                                                                                                   \nwarrow
x \leftarrow y
                                          x \rightarrow y
           \rightleftharpoons
                                                        \leadsto
x \rightleftharpoons y
                                          x \rightsquigarrow y
```

# **D.21** Miscellaneous Symbols Serif

```
\ldots
                       x \cdots y
                                  \cdots
                                                    x:y
                                                             \vdots
                                                                                x \cdot \cdot \cdot y
                                                                                           \ddots
x \dots y
x \aleph y
           \aleph
                                   \prime
                                                    x \forall y
                                                            \forall
                                                                                           \infty
                       xy
                                                                                x \infty y
x\hbar y
           \hbar
                        x\emptyset y
                                   \emptyset
                                                    x\exists y
                                                            \exists
                                                                                           \Box
                                                                                x \square y
                       x\nabla y
                                                                                           \Diamond
           \imath
                                   \nabla
                                                    x \neg y
                                                            \neg
хıу
                                                                                x \diamondsuit y
                                   \surd
                                                    xby
                                                             \flat
                                                                                           \triangle
x_{J}y
           \jmath
                       x\sqrt{y}
                                                                                x \triangle y
x\ell y
           \ell
                       x \top y
                                  \top
                                                    x 
array
                                                             \natural
                                                                                           \clubsuit
                                                                                x♣y
                                                    x \sharp y
                                                                                           \diamondsuit
           \wp
                       x \perp y
                                   \bot
                                                            \sharp
                                                                                x \diamond y
x \wp y
x\Re y
           \Re
                                                    x \setminus y
                                                            \backslash
                                                                                           \heartsuit
                       x||y
                                   \backslash I
                                                                                x \heartsuit y
x\Im y
           \Im
                                   \angle
                                                    x\partial y \partial
                                                                                           \spadesuit
                       x \angle y
                                                                                x \spadesuit y
x \nabla y
           \mho
                                                    x|y
                                                                                x!y
                                                                                           !
                       x.y
```

# **D.22** Variable-Sized Operators Serif

```
x \sum y
                                            x \odot y
                                                     \bigodot
        \sum
                    x \cap y \bigcap
x \prod y
                    x \cup y
                                            x \otimes y \bigotimes
        \prod
                            \bigcup
                    x \sqcup y \bigsqcup x \oplus y \bigoplus
x \coprod y
        \coprod
x \mid y
                             \bigvee
                                                     \biguplus
        \int
                    x \vee y
                                            x \uplus y
                             \bigwedge
x \phi y
        \oint
                    x \wedge y
```

# **D.23** Log-Like Operators Serif

```
x \arccos y = x \cos y
                          x \csc y
                                     x \exp y
                                                 x ker y
                                                                x lim sup y
                                                                               x \min y \quad x \sinh y
              x \cosh y
x arcsin y
                         x \deg y
                                     x \gcd y
                                                 x \lg y
                                                                x \ln y
                                                                               x \Pr y
                                                                                          x \sup y
x arctan y
              x \cot y
                          x \det y
                                     x hom y
                                                 x \lim y
                                                                x \log y
                                                                               x \sec y
                                                                                          x \tan y
                                                 x \lim \inf y
x \arg y
              x \coth y
                          x \dim y
                                     x \inf y
                                                               x \max y
                                                                               x \sin y
                                                                                          x \tanh y
```

#### **D.24** Delimiters Serif

```
x(y)
      (
                    x)y
                          )
                                        x \uparrow y
                                                 \uparrow
                                                                      x \uparrow y
                                                                               \Uparrow
                    x]y
                                        x \downarrow y
                                                 \downarrow
                                                                      x \downarrow y
                                                                               \Downarrow
x[y]
      [
                          ]
                                        x \uparrow y
                                                 \updownarrow
                                                                      x \updownarrow y
                                                                               \Updownarrow
x\{y
      \{
                    x\}y
                          \}
       \lfloor
                          \rfloor
                                                  \lceil
                                                                               \rceil
x \mid y
                   x \mid y
                                        x[y]
                                                                      x y
       \langle
                           \rangle x/y
                                                                               \backslash
x\langle y
                    x\rangle y
                                                 /
                                                                      x \setminus y
                    x||y
x|y
       Т
                           \mathbf{I}
```

# **D.25** Large Delimiters Serif

```
\ \rmoustache \int \lmoustache \) \rgroup \( \lgroup \)
\ \arrowvert \| \Arrowvert \| \bracevert \]
```

### **D.26** Math Mode Accents Serif

```
\hat{a} \hat{a} \acute{a} \acute{a} \bar{a} \bar{a} \acute{a} \dot{a} \breve{a} \breve{a} \check{a} \check{a} \grave{a} \grave{a} \vec{a} \vec{a} \ddot{a} \dot{a} \tilde{a} \tilde{a}
```

### **D.27** Miscellaneous Constructions Serif

$\widetilde{abc}$	\widetilde{abc}	$\widehat{abc}$	\widehat{abc}
$\overrightarrow{abc}$	\overleftarrow{abc}	$\overrightarrow{abc}$	\overrightarrow{abc}
$\overline{abc}$	<pre>\overline{abc}</pre>	<u>abc</u>	\underline{abc}
$\widetilde{abc}$	\overbrace{abc}	$\underbrace{abc}$	\underbrace{abc}
$\sqrt{abc}$	\sqrt{abc}	$\sqrt[n]{abc}$	\sqrt[n]{abc}
f'	f′	<u>abc</u> xyz	\frac{abc}{xyz}

#### **D.28** AMS Delimiters Serif

 $x \vdash y$  \ulcorner  $x \dashv y$  \urcorner  $x \perp y$  \llcorner  $x \perp y$  \lrcorner

### D.29 AMS Arrows Serif

```
x \rightarrow y
          \dashrightarrow
                                              x \leftarrow y \setminus \mathsf{dashleftarrow}
x \Leftarrow y \leftleftarrows
                                             x \leftrightarrows y \leftrightarrows
x \Leftarrow y \setminus Lleftarrow
                                             x \leftarrow y \twoheadleftarrow
x \leftarrow y \setminus \text{leftarrowtail}
                                             x \leftrightarrow y \looparrowleft
                                              x \sim y \setminus \text{curvearrowleft}
x \leftrightharpoons y
          \leftrightharpoons
          \circlearrowleft
x \circlearrowleft y
                                              x \circ y
                                                         \Lsh
                                                         \upharpoonleft
x \uparrow \uparrow y
           \upuparrows
                                              x \mid y
x \downarrow y
           \downharpoonleft
                                             x \multimap y \setminus \text{multimap}
x \leftrightarrow y \leftrightsquigarrow x \rightrightarrows y \rightrightarrows
          \rightleftarrows
                                             x \Rightarrow y \rightrightarrows
x \rightleftharpoons y
x \rightleftharpoons y
          \rightleftarrows
                                              x \rightarrow y \twoheadrightarrow
x \rightarrow y \quad \text{rightarrowtail}
                                              x \leftrightarrow y
                                                        \looparrowright
          \rightleftharpoons
                                              x \sim y \curvearrowright
x \rightleftharpoons y
x \cup y
          \circlearrowright
                                              x \bowtie y
                                                        \Rsh
x \downarrow \downarrow y \downdownarrows
                                                        \upharpoonright
                                             x \mid y
                                             x \rightsquigarrow y \setminus \text{rightsquigarrow}
x \downarrow y
           \downharpoonright
```

# **D.30** AMS Negated Arrows Serif

```
x \nleftrightarrow y \nleftarrow x \nleftrightarrow y \nrightarrow x \nleftrightarrow y \nRightarrow x \nleftrightarrow y \nleftrightarrow x \nleftrightarrow y \nleftrightarrow
```

### D.31 AMS Greek Serif

xFy \digamma xxy \varkappa

#### D.32 AMS Hebrew Serif

 $x \exists y \ \text{beth} \ x \exists y \ \text{daleth} \ x \exists y \ \text{gimel}$ 

### **D.33** AMS Miscellaneous Serif

```
x\hbar y
        \hbar
                             хħу
                                     \hslash
x \triangle y \vartriangle
                             x \nabla y \triangledown
x\Box y
        \square
                                     \lozenge
                             x \diamond y
x \otimes y
       \circledS
                             x \angle y
                                     \angle
x \angle y
        \measuredangle x \not\equiv y
                                     \nexists
x \nabla y
                                     \ Finv^u
        \mho
                             x \exists y
       \Game^u
x \supset y
                             x k y
                                     \Bbbk^u
                             x\emptyset y
x\y
       \backprime
                                     \varnothing
x \blacktriangle y \blacktriangle x \blacktriangledown y
                                     \blacktriangledown
xy \blacksquare
                                     \blacklozenge
                             x♦y
x★y \bigstar
                                     \sphericalangle
                             x < y
x Cy
                                     \eth
        \complement
                             хðу
        \diagup^u
                             x \setminus y \setminus diagdown^u
x/y
     <sup>u</sup> Not defined in amssymb.sty, define using the \newsymbol command.
```

# **D.34** AMS Binary Operators Serif

$x \dotplus y$	\dotplus	$x \setminus y$	\smallsetminus
$x \cap y$	\Cap	$x \cup y$	\Cup
$x \overline{\wedge} y$	\barwedge	$x \vee y$	\veebar
$x \overline{\wedge} y$	\doublebarwedge	$x \boxminus y$	\boxminus
$x \boxtimes y$	\boxtimes	$x \odot y$	\boxdot
$x \boxplus y$	\boxplus	x * y	\divideontimes
$x \ltimes y$	\ltimes	$x \rtimes y$	\rtimes
$x \searrow y$	\leftthreetimes	$x \prec y$	\rightthreetimes
$x \wedge y$	\curlywedge	$x \vee y$	\curlyvee
$x \ominus y$	\circleddash	$x \circledast y$	\circledast
$x \odot y$	\circledcirc	$x \cdot y$	\centerdot
x + y	\intercal		

### **D.35** AMS Relations Serif

\leqslant

\lesssim

 $x \le y$  $x \le y$ 

```
x \approx y
         \approxeq
x \ll y \setminus 111
x \leq y
         \lesseqgtr
x \neq y
          \doteqdot
          \fallingdotseq
x = y
x \simeq y
         \backsimeq
         \Subset
x \subseteq y
         \preccurlyeq
x \leq y
         \precsim
x \lesssim y
x \triangleleft y
         \vartriangleleft
          \vDash
x \models y
          \smallsmile
x \sim y
x = y
         \bumpeq
x \ge y
         \geqq
x \geqslant y
          \eqslantgtr
x \geq y
          \gtrapprox
x \gg y \setminus ggg
x \geq y
          \gtreqless
x = y
          \eqcirc
         \triangleq
x \triangleq y
x \approx y
          \thickapprox
          \Supset
x \ni y
x \geqslant y
          \succcurlyeq
          \succsim
x \gtrsim y
          \vartriangleright
x \triangleright y
          \Vdash
x \Vdash y
          \shortparallel
x \parallel y
          \pitchfork
x \pitchfork y
          \blacktriangleleft
x \triangleleft y
          \backepsilon
x \ni y
x : y
          \because
```

# **D.36** AMS Negated Relations Serif

```
x \not< y \setminus \text{nless}
                                           x \not\leq y \setminus \text{nleq}
x \not\leq y \setminus \text{nleqslant}
                                           x \not \leq y \setminus \mathsf{nleqq}
                                           x \not\subseteq y \setminus lneqq
x \leq y \setminus lneq
x \leq y \lvertneqq
                                          x \leq y \setminus lnsim
                                          x \not\prec y \setminus \mathsf{nprec}
x \leq y \setminus lnapprox
x \not \leq y \setminus \mathsf{npreceq}
                                           x \leq y \setminus precnsim
                                           x ≁ y \nsim
x \lessapprox y \precnapprox
x * y \nshortmid
                                           x \nmid y \setminus \mathsf{nmid}
x \not\vdash y \setminus \text{nvdash}
                                           x \not\models y \setminus \text{nvDash}
x \not= y \ntriangleleft x \not= y \ntrianglelefteq
x \not\subseteq y \nsubseteq
                                          x \subsetneq y \setminus \text{subsetneq}
                                          x \subsetneq y \subsetneqq
x \subsetneq y \varsubsetneq
x \subseteq y \varsubsetneqq x \not> y \ngtr
x \not\geq y \setminus \mathsf{ngeq}
                                           x \not \geq y \setminus \text{ngeqslant}
x \not\geq y \setminus \mathsf{ngeqq}
                                           x \geqslant y \setminus gneq
x \not \supseteq y \setminus \mathsf{gneqq}
                                           x \geq y \gvertneqq
x \gtrsim y \setminus \mathsf{gnsim}
                                           x \geq y \setminus \mathsf{gnapprox}
x \not\succ y \setminus \mathsf{nsucc}
                                           x \not\geq y \nsucceq
x \not \geq y \setminus \mathsf{nsucceqq}
                                          x \gtrsim y \succnsim
x \geq y \succnapprox
                                          x \not\cong y \setminus \text{ncong}
x \times y \nshortparallel x \not\parallel y \nparallel
                                          x ⊭ y \nVDash
x \not\models y \setminus \text{nvDash}
x \not\triangleright y \ntriangleright x \not\trianglerighteq y \ntrianglerighteq
                                           x \not\supseteq y \nsupseteqq
x \not\supseteq y \setminus \mathsf{nsupseteq}
x \supseteq y \supsetneq
                                           x \supseteq y \varsupsetneq
x \supseteq y \supsetnegg
                                          x \supseteq y \varsupsetneqq
```

#### D.37 Math "Torture" Test Serif

Most of the following examples are taken from *The T<sub>E</sub>Xbook* (Knuth, 1984, see https://ctan.org/pkg/texbook) and were adapted for LAT<sub>E</sub>X from Karl Berry's torture test for plain T<sub>E</sub>X math fonts.

```
x+y-z, \quad x+y*z, \quad z*y/z, \quad (x+y)(x-y)=x^2-y^2, x\times y\cdot z=[x\,y\,z], \quad x\circ y\bullet z, \quad x\cup y\cap z, \quad x\sqcup y\sqcap z, x\vee y\wedge z, \quad x\pm y\mp z, \quad x=y/z, \quad x:=y, \quad x\leq y\neq z, \quad x\sim y\simeq z \ x\equiv y\not\equiv z, \quad x\subset y\subseteq z \sin 2\theta=2\sin\theta\cos\theta, \quad O(n\log n\log n), \quad \Pr(X>x)=\exp(-x/\mu), \left(x\in A(n)\ \middle|\ x\in B(n)\right), \quad \bigcup_n X_n\ \middle\|\ \bigcap_n Y_n \text{In-text matrices } \begin{pmatrix} 1\ 1\ 0\ 1 \end{pmatrix} \text{ and } \begin{pmatrix} a\ b\ c\ 1\ m\ n \end{pmatrix}.
```

$$a_{0} + \frac{1}{a_{1} + \frac{1}{a_{2} + \frac{1}{a_{3} + \frac{1}{a_{4}}}}}$$

$$\binom{p}{2}x^{2}y^{p-2} - \frac{1}{1-x}\frac{1}{1-x^{2}} = \frac{a+1}{b} / \frac{c+1}{d}.$$

$$\sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + x}}}}}$$

$$\sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + x}}}}}$$

$$\left(\frac{\partial^{2}}{\partial x^{2}} + \frac{\partial^{2}}{\partial y^{2}}\right) |\varphi(x+iy)|^{2} = 0$$

$$\pi(n) = \sum_{m=2}^{n} \left[ \left(\sum_{k=1}^{m-1} \left\lfloor \frac{(m/k)}{m/k} \right\rfloor \right)^{-1} \right].$$

$$\int_{0}^{\infty} \frac{t-ib}{t^{2} + b^{2}} e^{iat} dt = e^{ab} E_{1}(ab), \quad a, b > 0.$$

$$A := \begin{pmatrix} x - \lambda & 1 & 0 \\ 0 & x - \lambda & 1 \end{pmatrix}.$$

$$A := \begin{pmatrix} x - \lambda & 1 & 0 \\ 0 & x - \lambda & 1 \\ 0 & 0 & x - \lambda \end{pmatrix}.$$

$$\begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix} \begin{pmatrix} u & x \\ v & y \\ w & z \end{pmatrix}$$

$$\mathbf{A} = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix}$$

$$C \qquad I \qquad C'$$

$$C \qquad \begin{pmatrix} 1 & 0 & 0 \\ b & 1-b & 0 \\ C' & 0 & a & 1-a \end{pmatrix}$$

$$\sum_{n=0}^{\infty} a_n z^n \quad \text{converges if} \quad |z| < \left( \limsup_{n \to \infty} \sqrt[n]{|a_n|} \right)^{-1}.$$

$$\frac{f(x + \Delta x) - f(x)}{\Delta x} \to f'(x) \qquad \text{as } \Delta x \to 0.$$

$$||u_i|| = 1,$$
  $u_i \cdot u_j = 0$  if  $i \neq j$ .

The confluent image of  $\begin{cases} an \ arc \\ a \ circle \\ a \ fan \end{cases}$  is  $\begin{cases} an \ arc \\ an \ arc \ or \ a \ circle \\ a \ fan \ or \ an \ arc \end{cases}$ .

$$T(n) \leq T(2^{\lceil \lg n \rceil}) \leq c(3^{\lceil \lg n \rceil} - 2^{\lceil \lg n \rceil})$$

$$< 3c \cdot 3^{\lg n}$$

$$= 3c n^{\lg 3}.$$

$$(x + y)(x - y) = x^{2} - xy + yx - y^{2}$$
$$= x^{2} - y^{2}$$
$$(x + y)^{2} = x^{2} + 2xy + y^{2}.$$

$$\left(\int_{-\infty}^{\infty} e^{-x^2} dx\right)^2 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2 + y^2)} dx dy$$
$$= \int_{0}^{2\pi} \int_{0}^{\infty} e^{-r^2} dr d\theta$$
$$= \int_{0}^{2\pi} \left(e^{-\frac{r^2}{2}}\Big|_{r=0}^{r=\infty}\right) d\theta$$
$$= \pi$$

$$\prod_{k \ge 0} \frac{1}{(1 - q^k z)} = \sum_{n \ge 0} z^n / \prod_{1 \le k \le n} (1 - q^k).$$

$$\sum_{\substack{0 < i \le m \\ 0 < j \le n}} p(i, j) \neq \sum_{i=1}^{p} \sum_{j=1}^{q} \sum_{k=1}^{r} a_{ij} b_{jk} c_{ki} \neq \sum_{\substack{1 \le i \le p \\ 1 \le j \le q \\ 1 < k < r}} a_{ij} b_{jk} c_{ki}$$

$$\max_{1 \le n \le m} \log_2 P_n \quad \text{and} \quad \lim_{x \to 0} \frac{\sin x}{x} = 1$$

Inline math:  $\max_{1 \le n \le m} \log_2 P_n$  and  $\lim_{x \to 0} \frac{\sin x}{x} = 1$ 

$$p_1(n) = \lim_{m \to \infty} \sum_{v=0}^{\infty} (1 - \cos^{2m}(v!^n \pi/n))$$

Inline math:  $p_1(n) = \lim_{m \to \infty} \sum_{\nu=0}^{\infty} (1 - \cos^{2m}(\nu!^n \pi/n))$ 

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# Selbstständigkeitserklärung

Ich versichere hiermit, dass ich die vorstehende Masterarbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe, dass die vorgelegte Arbeit noch an keiner anderen Hochschule zur Prüfung vorgelegt wurde und dass sie weder ganz noch in Teilen bereits veröffentlicht wurde. Wörtliche Zitate und Stellen, die anderen Werken dem Sinn nach entnommen sind, habe ich in jedem einzelnen Fall kenntlich gemacht.

10. Dezember 2020

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