

# Characterizing NC<sup>1</sup> with Typed Semigroups

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## Abstract

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Praesent convallis orci arcu, eu mollis dolor. Aliquam eleifend suscipit lacinia. Maecenas quam mi, porta ut lacinia sed, convallis ac dui. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Suspendisse potenti.

**2012 ACM Subject Classification** Replace ccsdesc macro with valid one

**Keywords and phrases** Dummy keyword

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- 49 ■ `\keywords` (a comma-separated list of keywords).
- 50 ■ `\relatedversion` (if there is a related version, typically the “full version”); please make
- 51 sure to provide a persistent URL, e. g., at arXiv.
- 52 ■ `\begin{abstract}...\end{abstract}` .

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## 77 2 Lorem ipsum dolor sit amet

78 Lorem ipsum dolor sit amet, consectetur adipiscing elit [?]. Praesent convallis orci arcu, eu  
79 mollis dolor. Aliquam eleifend suscipit lacinia. Maecenas quam mi, porta ut lacinia sed,  
80 convallis ac dui. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Suspendisse potenti.  
81 Donec eget odio et magna ullamcorper vehicula ut vitae libero. Maecenas lectus nulla, auctor  
82 nec varius ac, ultricies et turpis. Pellentesque id ante erat. In hac habitasse platea dictumst.  
83 Curabitur a scelerisque odio. Pellentesque elit risus, posuere quis elementum at, pellentesque  
84 ut diam. Quisque aliquam libero id mi imperdiet quis convallis turpis eleifend.

■ **Listing 1** Useless code.

```
for i:=maxint to 0 do
begin
  j:=square(root(i));
end;
```

85 ► **Lemma 1** (Lorem ipsum). *Vestibulum sodales dolor et dui cursus iaculis. Nullam ullam-*  
 86 *corper purus vel turpis lobortis eu tempus lorem semper. Proin facilisis gravida rutrum.*  
 87 *Etiam sed sollicitudin lorem. Proin pellentesque risus at elit hendrerit pharetra. Integer at*  
 88 *turpis varius libero rhoncus fermentum vitae vitae metus.*

89 **Proof.** Cras purus lorem, pulvinar et fermentum sagittis, suscipit quis magna.

90 **Just some paragraph within the proof.** Nam liber tempor cum soluta nobis eleifend option  
 91 congue nihil imperdiet doming id quod mazim placerat facer possim assum. Lorem ipsum  
 92 dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut  
 93 laoreet dolore magna aliquam erat volutpat.

94 ▷ **Claim 2.** content...

95 Proof. content...

96 1. abc abc abc

97

98 ► **Corollary 3** (Curabitur pulvinar, [?]). *Nam liber tempor cum soluta nobis eleifend option*  
 99 *congue nihil imperdiet doming id quod mazim placerat facer possim assum. Lorem ipsum*  
 100 *dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut*  
 101 *laoreet dolore magna aliquam erat volutpat.*

102 ► **Proposition 4.** *This is a proposition*

103 Proposition 4 and Proposition 4 ...

## 104 2.1 Curabitur dictum felis id sapien

105 Curabitur dictum Corollary 3 felis id sapien Corollary 3 mollis ut venenatis tortor feugiat.  
 106 Curabitur sed velit diam. Integer aliquam, nunc ac egestas lacinia, nibh est vehicula nibh, ac  
 107 auctor velit tellus non arcu. Vestibulum lacinia ipsum vitae nisi ultrices eget gravida turpis  
 108 laoreet. Duis rutrum dapibus ornare. Nulla vehicula vulputate iaculis. Proin a consequat  
 109 neque. Donec ut rutrum urna. Morbi scelerisque turpis sed elit sagittis eu scelerisque quam  
 110 condimentum. Pellentesque habitant morbi tristique senectus et netus et malesuada fames  
 111 ac turpis egestas. Aenean nec faucibus leo. Cras ut nisl odio, non tincidunt lorem. Integer  
 112 purus ligula, venenatis et convallis lacinia, scelerisque at erat. Fusce risus libero, convallis at  
 113 fermentum in, dignissim sed sem. Ut dapibus orci vitae nisl viverra nec adipiscing tortor  
 114 condimentum [?]. Donec non suscipit lorem. Nam sit amet enim vitae nisl accumsan pretium.

## 115 2.2 Proin ac fermentum augue

116 Proin ac fermentum augue. Nullam bibendum enim sollicitudin tellus egestas lacinia euismod  
 117 orci mollis. Nulla facilisi. Vivamus volutpat venenatis sapien, vitae feugiat arcu fringilla ac.

## 23:4 Characterizing NC<sup>1</sup> with Typed Semigroups

118 Mauris sapien tortor, sagittis eget auctor at, vulputate pharetra magna. Sed congue, dui  
119 nec vulputate convallis, sem nunc adipiscing dui, vel venenatis mauris sem in dui. Praesent  
120 a pretium quam. Mauris non mauris sit amet eros rutrum aliquam id ut sapien. Nulla  
121 aliquet fringilla sagittis. Pellentesque eu metus posuere nunc tincidunt dignissim in tempor  
122 dolor. Nulla cursus aliquet enim. Cras sapien risus, accumsan eu cursus ut, commodo vel  
123 velit. Praesent aliquet consectetur ligula, vitae iaculis ligula interdum vel. Integer faucibus  
124 faucibus felis.

- 125 ■ Ut vitae diam augue.
  - 126 ■ Integer lacus ante, pellentesque sed sollicitudin et, pulvinar adipiscing sem.
  - 127 ■ Maecenas facilisis, leo quis tincidunt egestas, magna ipsum condimentum orci, vitae  
128 facilisis nibh turpis et elit.
- 129 ► Remark 5. content...

### 130 3 Pellentesque quis tortor

131 Nec urna malesuada sollicitudin. Nulla facilisi. Vivamus aliquam tempus ligula eget ornare.  
132 Praesent eget magna ut turpis mattis cursus. Aliquam vel condimentum orci. Nunc congue,  
133 libero in gravida convallis [?], orci nibh sodales quam, id egestas felis mi nec nisi. Suspendisse  
134 tincidunt, est ac vestibulum posuere, justo odio bibendum urna, rutrum bibendum dolor sem  
135 nec tellus.

136 ► **Lemma 6** (Quisque blandit tempus nunc). *Sed interdum nisl pretium non. Mauris sodales  
137 consequat risus vel consectetur. Aliquam erat volutpat. Nunc sed sapien ligula. Proin faucibus  
138 sapien luctus nisl feugiat convallis faucibus elit cursus. Nunc vestibulum nunc ac massa  
139 pretium pharetra. Nulla facilisis turpis id augue venenatis blandit. Cum sociis natoque  
140 penatibus et magnis dis parturient montes, nascetur ridiculus mus.*

141 Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui. Nam  
142 vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa sit  
143 amet neque.

### 144 4 Morbi eros magna

145 Morbi eros magna, vestibulum non posuere non, porta eu quam. Maecenas vitae orci risus,  
146 eget imperdiet mauris. Donec massa mauris, pellentesque vel lobortis eu, molestie ac turpis.  
147 Sed condimentum convallis dolor, a dignissim est ultrices eu. Donec consectetur volutpat  
148 eros, et ornare dui ultricies id. Vivamus eu augue eget dolor euismod ultrices et sit amet nisi.  
149 Vivamus malesuada leo ac leo ullamcorper tempor. Donec justo mi, tempor vitae aliquet non,  
150 faucibus eu lacus. Donec dictum gravida neque, non porta turpis imperdiet eget. Curabitur  
151 quis euismod ligula.

### 152 A Styles of lists, enumerations, and descriptions

153 List of different predefined enumeration styles:

- 154 ■ `\begin{itemize}...\end{itemize}`
- 155 ■ ...
- 156 ■ ...

157 1. `\begin{enumerate}...\end{enumerate}`  
 158 2. ...  
 159 3. ...

160 (a) `\begin{alphaenumerate}...\end{alphaenumerate}`  
 161 (b) ...  
 162 (c) ...

163 (i) `\begin{romanenumerate}...\end{romanenumerate}`  
 164 (ii) ...  
 165 (iii) ...

166 (1) `\begin{bracketenumerate}...\end{bracketenumerate}`  
 167 (2) ...  
 168 (3) ...

169 **Description 1** `\begin{description} \item[Description 1] ... \end{description}`  
 170 **Description 2** Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.  
 171 Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus  
 172 massa sit amet neque.  
 173 **Description 3** ...

174 Proposition 10 and Proposition 10 ...

## 175 **B** Theorem-like environments

176 List of different predefined enumeration styles:

177 ► **Theorem 7.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
 178 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
 179 *sit amet neque.*

180 ► **Lemma 8.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
 181 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
 182 *sit amet neque.*

183 ► **Corollary 9.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
 184 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
 185 *sit amet neque.*

186 ► **Proposition 10.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo*  
 187 *dui. Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus*  
 188 *massa sit amet neque.*

189 ► **Conjecture 11.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo*  
 190 *dui. Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus*  
 191 *massa sit amet neque.*

192 ► **Observation 12.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et*  
 193 *leo dui. Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus*  
 194 *massa sit amet neque.*

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195 ► **Exercise 13.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo*  
196 *dui. Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus*  
197 *massa sit amet neque.*

198 ► **Definition 14.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo*  
199 *dui. Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus*  
200 *massa sit amet neque.*

201 ► **Example 15.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo*  
202 *dui. Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus*  
203 *massa sit amet neque.*

204 ► **Note 16.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
205 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
206 *sit amet neque.*

207 ► **Note.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui. Nam*  
208 *vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa sit*  
209 *amet neque.*

210 ► **Remark 17.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
211 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
212 *sit amet neque.*

213 ► **Remark.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
214 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
215 *sit amet neque.*

216 ▷ **Claim 18.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
217 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
218 *sit amet neque.*

219 ▷ **Claim.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui.*  
220 *Nam vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa*  
221 *sit amet neque.*

222 **Proof.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui. Nam*  
223 *vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa sit*  
224 *amet neque.* ◀

225 **Proof.** *Fusce eu leo nisi. Cras eget orci neque, eleifend dapibus felis. Duis et leo dui. Nam*  
226 *vulputate, velit et laoreet porttitor, quam arcu facilisis dui, sed malesuada risus massa sit*  
227 *amet neque.* ◁