

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\Projects\\BBS"];  
srcdir = "C:\\drorbn\\BBS\\shots\\"
```

```
C:\\drorbn\\BBS\\shots\\
```

```
fnames = FileNames["17-1750-*", srcdir]
```

```
{C:\\drorbn\\BBS\\shots\\17-1750-170911-111542.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170911-111543.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170911-111544.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170911-111545.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170911-111546.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123315.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123316.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123317.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123318.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123319.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123320.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123321.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170915-123322.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170918-111026.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170918-111027.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170922-121308.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170922-121309.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170925-111210.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170925-111211.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170925-111212.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170925-111213.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170929-142832.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170929-142833.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170929-142834.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170929-142835.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-170929-142836.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-171002-111023.jpg,  
C:\\drorbn\\BBS\\shots\\17-1750-171002-111024.jpg}
```

Rasterize[shot = Import[fnames[[8]]]

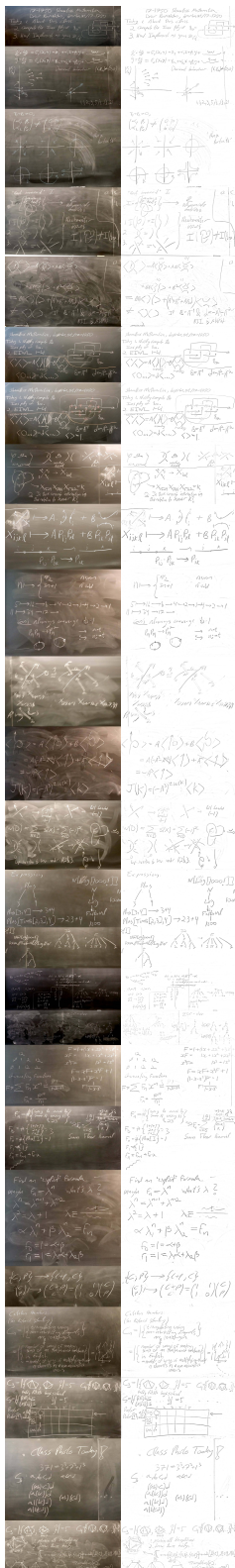
```

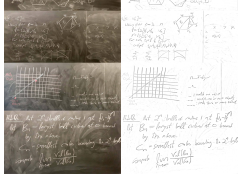
BBImprove[shot_] := Module[{diag, s1, s2},
  diag = Norm[ImageDimensions[shot]];
  s1 = ColorConvert[shot, "Grayscale"];
  s2 = ImageAdjust[
    ImageApply[Max[#1 - #2, 0] &, {s1, Blur[s1, 0.01 diag]}] // ColorNegate;
    ImageAdjust[s2, 0.05]
  ];
BBImprove[shot] // Rasterize

```

```
origs = Import /@ fnames;  
imps = BBImprove /@ origs;
```

```
ImageAssemble[Transpose[{origs, imps}]] // Rasterize
```





`Length [frames]`

28

`300 {8./3, 10.5/9}`

`{800., 350.}`

`ImageDimensions [origs[[1]]]`

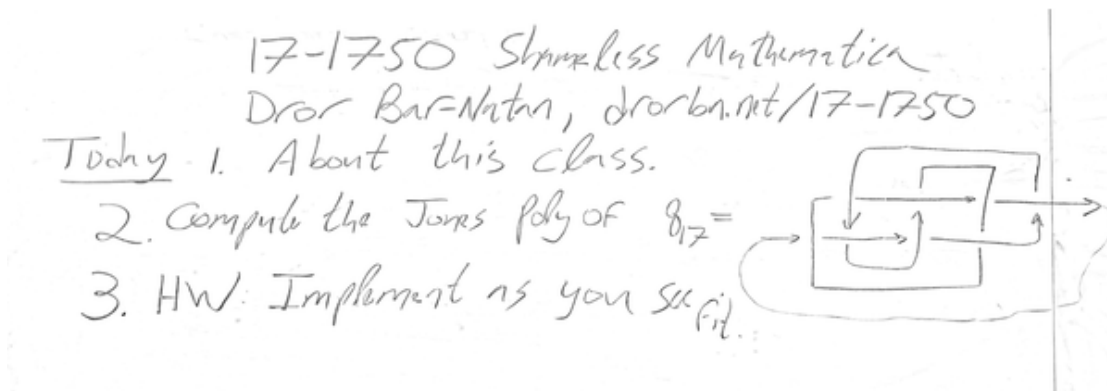
`{1600, 556}`

`Min [ImageDimensions [origs[[1]]], {600., 450.}]`

1.23556

```
ImageRescale[img_, {w_, h_}] := ImageCrop[
  ImageResize[img, Scaled[Min[{w, h} / ImageDimensions[img]]],
  {w, h}, Padding -> White
];
```


`ImageRescale[imps[[1]], {600, 450}] // Rasterize`



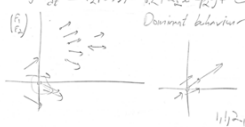
Rasterize[

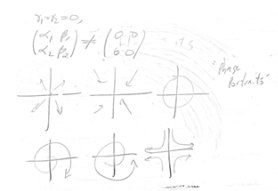
ContactSheet = ImageAssemble[Partition[ImageRescale[#, {800, 350}] & /@ imps, 3]]]

17-1750 Shorless Mathematics
 Dror Bar-Natan, drorbn@17-1750
 Today 1. About this class.
 2. Complete the Jones poly of R_2
 3. HW: Implement as you see fit




$x = \frac{y}{z} = F_1(x, y) = x_1 + x_2 + y + \dots$
 $y = \frac{x}{z} = F_2(x, y) = x_1 + x_2 + y + \dots$
 Derivative behavior $(F_1, F_2) \circ (F_1, F_2)$






"outward" I
 $I_1 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
 $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
 $I_3 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
 $I(B) = I(B)$




$\langle \cdot \rangle = R \langle \cdot \rangle + A \langle \cdot \rangle$
 $+ B \langle \cdot \rangle + C \langle \cdot \rangle$
 $= AB \langle \cdot \rangle + (A^2 + B^2) \langle \cdot \rangle$
 $\neq \langle \cdot \rangle$ if $B = A^{-1}$ & $d = -A^{-1}A^{-2}$
 RJI is a twist

Shorless Mathematics, drorbn@17-1750
 Today 1. Noddy complete the
 Jones poly of R_2 .
 2. EIWL 1-4.



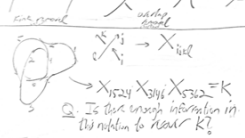
$\langle \cdot \rangle = A \langle \cdot \rangle + B \langle \cdot \rangle$
 $\langle 0 \dots \rangle = d \langle \dots \rangle$
 $B = A^{-1}$ $d = -A^{-1}A^{-2}$

Shorless Mathematics, drorbn@17-1750
 Today 1. Noddy complete the
 Jones poly of R_2 .
 2. EIWL 1-4.

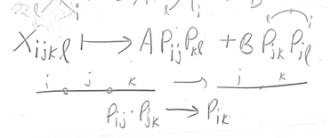


$\langle \cdot \rangle = A \langle \cdot \rangle + B \langle \cdot \rangle$
 $\langle 0 \dots \rangle = d \langle \dots \rangle$ $\langle \cdot \rangle = 1$
 $B = A^{-1}$ $d = -A^{-1}A^{-2}$

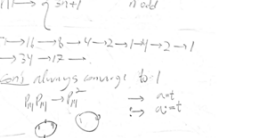
$X_{ijk} \rightarrow X_{ij} X_{jk} = K$
 Is that enough information in
 the relation to recover K ?



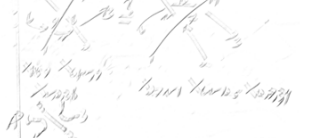
$X_{ijk} \rightarrow A P_{ij} P_{jk} + B P_{jk} P_{ij}$
 $P_{ij} \cdot P_{jk} \rightarrow P_{ik}$



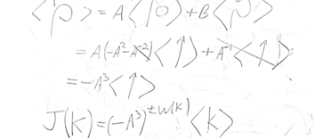
$11 \rightarrow \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$
 $5 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 2 \rightarrow 1$
 $11 \rightarrow 3 \rightarrow 4 \rightarrow 2 \rightarrow 1$
 all always converge to 1
 $11 \rightarrow 1$ not $11 \rightarrow 2$



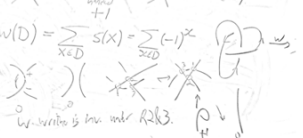
Expression.
 plus $\begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix} \rightarrow 3+4$
 plus [Times $\begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$] $\rightarrow 2 \cdot 3 + 3 \cdot 4$



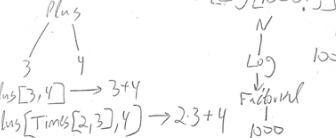
$\langle 1 \rangle = A \langle 0 \rangle + B \langle 0 \rangle$
 $= A(-A^{-1} \langle 1 \rangle) + A^{-1} \langle 1 \rangle$
 $= -A^2 \langle 1 \rangle$
 $J(K) = (-A^2)^{\text{writhe}(K)} \langle K \rangle$



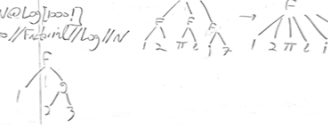
$W(D) = \sum_{x \in D} s(x) = \sum_{x \in D} (-1)^x$
 $W(D) = \sum_{x \in D} (-1)^x$
 $W(D) = \sum_{x \in D} (-1)^x$



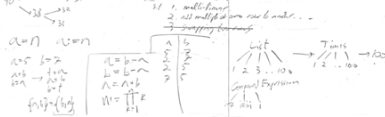
$N[\log[1000!]]$
 $N \log 1000$
 $N \log 1000$
 $N \log 1000$



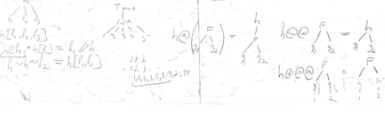
$N[\log[1000!]]$
 $1000 / \ln(10) \approx 143$
 $1000 / \ln(10) \approx 143$
 $1000 / \ln(10) \approx 143$



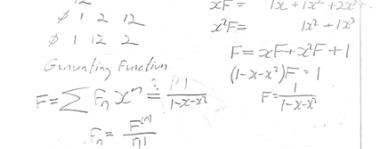
$10 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9 \rightarrow 10$
 $10 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9 \rightarrow 10$
 $10 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9 \rightarrow 10$



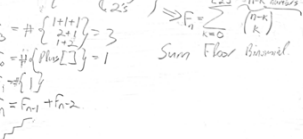
$\sum_{k=0}^n x^k = \frac{1-x^{n+1}}{1-x}$
 $\sum_{k=0}^n x^k = \frac{1-x^{n+1}}{1-x}$
 $\sum_{k=0}^n x^k = \frac{1-x^{n+1}}{1-x}$



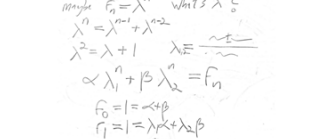
$F = 1 + 12x + 22x^2 + 32x^3 + \dots$
 $x^2 F = 12x + 22x^2 + 32x^3 + \dots$
 $F - x^2 F = 1 + 12x - 12x + 12x^2 - 22x^2 + 22x^2 - 32x^3 + \dots$
 $F(1-x^2) = 1 + 12x^2 - 32x^3 + \dots$
 $F = \frac{1}{1-x^2}$



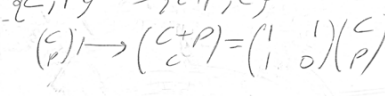
$F_n = \# \{ \text{ways to write } n \}$
 $F_0 = 1$
 $F_1 = 1$
 $F_2 = 2$
 $F_3 = 3$
 $F_4 = 5$
 $F_5 = 8$
 $F_6 = 13$
 $F_7 = 21$
 $F_8 = 34$
 $F_9 = 55$
 $F_{10} = 89$



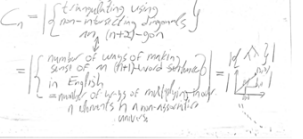
Find an explicit formula.
 maybe $F_n = \lambda^n + \mu^n$ what's λ ?
 $\lambda^n = \lambda^{n-1} + \lambda^{n-2}$
 $\lambda^2 = \lambda + 1$ $\lambda = \frac{1 \pm \sqrt{5}}{2}$
 $\lambda^n + \mu^n = F_n$
 $F_0 = 1 = \lambda^0 + \mu^0$
 $F_1 = 1 = \lambda^1 + \mu^1$



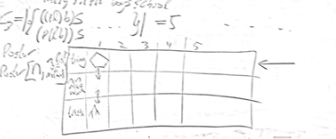
$\langle C; P \rangle \rightarrow \langle C+P, C \rangle$
 $\langle P \rangle \rightarrow \langle C+P \rangle = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \langle P \rangle$



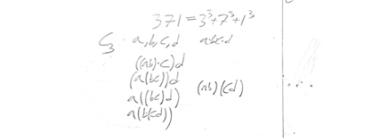
Calculus numbers:
 (in Richard Stanley)
 $C_n = \# \{ \text{ways to triangulate } n \text{ sides} \}$
 $C_n = \frac{1}{n} \binom{2n-2}{n-2}$
 $C_n = \frac{1}{n} \binom{2n-2}{n-2}$



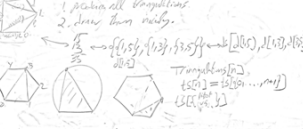
$C_3 = \{ \langle \cdot \rangle, \langle \cdot \rangle \} = 5$ $C_4 = \{ \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle \}$
 $C_5 = \{ \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle \} = 5$
 $C_6 = \{ \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle \}$



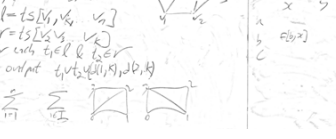
Class Photo Today
 $3 \cdot 7 = 3^2 + 7^2$
 $3 \cdot 7 = 3^2 + 7^2$
 $3 \cdot 7 = 3^2 + 7^2$



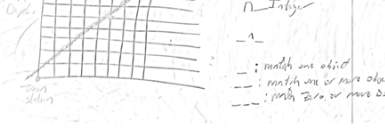
$C_3 = \{ \langle \cdot \rangle, \langle \cdot \rangle \} = 5$ $C_4 = \{ \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle \}$
 $C_5 = \{ \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle \}$
 $C_6 = \{ \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle, \langle \cdot \rangle \}$



$S(n, k) = \# \{ \text{ways to partition } n \text{ elements into } k \text{ non-empty subsets} \}$
 $S(n, k) = \frac{1}{k!} \sum_{j=0}^k (-1)^j \binom{k}{j} (k-j)^n$
 $S(n, k) = \frac{1}{k!} \sum_{j=0}^k (-1)^j \binom{k}{j} (k-j)^n$



n Today
 n Today
 n Today



Export ["ContactSheet.png", **ContactSheet**]

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