Title: Introduction to Mathematica - Lecture 2b

Date: Sep 07, 2012 10:30 AM

URL: http://pirsa.org/12090053

Abstract:

Untitled-8

Q&A

- ...

Untitled-8

?Cases

In[758]:=

```
? Cases
```

Untitled-8

?Cases

In[758]:=

```
? Cases
```

In[759]:=

```
α (k[2, 3] + 4 k[4, 5] + k[2, 3])
```

Out[759]=

```
α (2 k[2, 3] + 4 k[4, 5])
```

Hodges et al formulae.nb

```
n = 6;
ClearAll[j]
```

Generating Spinors (run once only)

Hodges

```
λ[l] = {l1, l2}; λ[r] = {r1, r2};
λ[l] = {1, 2}; λ[r] = {1/7, 1/8};
```

$$c[i\_, j\_, k\_] = \frac{1}{\langle i, j\rangle \langle j, k\rangle \langle k, i\rangle};$$

$$\Phi = \text{Table}\left[\text{If}\left[i == j, -\sum_{k=1}^{n} \text{If}\left[k == i, 0, \frac{\|i, k\| \langle k, r\rangle \langle k, l\rangle}{\langle i, k\rangle \langle i, r\rangle \langle i, l\rangle}\right], \frac{\|i, j\|}{\langle i, j\rangle}\right], \{i, n\}, \{j, n\}\right];$$

```
ϕ[c1_, c2_, c3_][r1_, r2_, r3_] :=
  (Φ /. rep // Drop[#, {c1}] & // Drop[#, {c2 - 1}] & // Drop[#, {c3 - 2}] & // Transpose // Drop[#, {r1}] & //
      Drop[#, {r2 - 1}] & // Drop[#, {r3 - 2}] & // Det) c[c1, c2, c3] c[r1, r2, r3] /. rep;
```

```
(hodges = ϕ[1, 2, 3][2, 3, 4] // Simplify) // N[#, 20] &
(ϕ[1, 2, 5][2, 4, 5] // Simplify) // N[#, 20] &
```

```
-0.03972393622679819368 6
```

```
-0.03972393622679819368 6
```

Indeed, independent of the choice of which columns and rows to remove and also independent of the reference spinors λ_l and λ_r

Mason-Skinner

Recursion Relation

Hodges et al formulae.nb

```
ϕ[c1_, c2_, c3_][r1_, r2_, r3_] :=
  (Φ /. rep // Drop[#, {c1}] & // Drop[#, {c2 - 1}] & // Drop[#, {c3 - 2}] & // Transpose // Drop[#, {r1}] & //
      Drop[#, {r2 - 1}] & // Drop[#, {r3 - 2}] & // Det) c[c1, c2, c3] c[r1, r2, r3] /. rep;
```

```
(hodges = ϕ[1, 2, 3][2, 3, 4] // Simplify) // N[#, 20] &
(ϕ[1, 2, 5][2, 4, 5] // Simplify) // N[#, 20] &
```

-0.03972393622679819368 6

-0.03972393622679819368 6

Indeed, independent of the choice of which columns and rows to remove and also independent of the reference spinors λ_l and λ_r

Mason-Skinner

```
perm[o_] := Table[k → Permutations[Range[3, n - 1]][[o]][[k - 2]], {k, 3, n - 1}]
```

$$\left(\text{MS} = \text{Monitor}\left[\sum_{o}^{(n-3)!}\left(\frac{\prod_{k=3}^{n-1}\left(\sum_{j=k+1}^{n}\|k,\,j\|\,\frac{\langle j,1\rangle}{\langle k,1\rangle}\right)}{\langle 1,2\rangle\,\langle 1,n\rangle\,\langle 2,n\rangle\,\prod_{i=1}^{n}\langle i,\,\text{Mod}[i+1,\,n,\,1]\rangle}\ /.\ \text{perm}[o]\ /.\ \text{rep}\right),\ \{o,\,k,\,j\}\right]\right)\ //$$

```
N[#, 20] &
```

0.03972393622679819368 6

```
MS / hodges
```

-1

Recursion Relation

KLT, relation (2.2) in 1206.1577

KLT from Freddy & Yvonne

Q&A

- ?Cases

In[766]:=

```
Cases[k[2, 3] + 4 k[4, 5] + k[2, 8], k[__], 2]
```

Out[766]=

```
{k[2, 3], k[2, 8], k[4, 5]}
```

In[763]:=

```
Cases[k[2, 3] + 4 k[4, 5] + k[2, 8], k[__]]
```

Out[763]=

```
{k[2, 3], k[2, 8]}
```

Q&A

- ?Cases

In[766]:=

```
Cases[k[2, 3] + 4 k[4, 5] + k[2, 8], k[__], 2]
```

Out[766]=

```
{k[2, 3], k[2, 8], k[4, 5]}
```

In[763]:=

```
Cases[k[2, 3] + 4 k[4, 5] + k[2, 8], k[__]]
```

Out[763]=

```
{k[2, 3], k[2, 8]}
```

Q&A

- ?Cases

In[766]:=

```
Cases[k[2, 3] + 4 k[4, 5] + k[2, 8], k[__], 2]
```

Out[766]=

```
{k[2, 3], k[2, 8], k[4, 5]}
```

In[763]:=

```
Cases[k[2, 3] + 4 k[4, 5] + k[2, 8], k[__]]
```

Out[763]=

```
{k[2, 3], k[2, 8]}
```

Untitled-8

Substitute with null elements

In[768]:=

```
x^2 + x + 1 /. x^a_. → f[a]
```

Out[768]=

```
1 + f[1] + f[2]
```

In[770]:=

```
x + 3 /. a_. x + b_ :→ {a, b}
```

Out[770]=

```
{1, 3}
```

Untitled-8

Substitu

In[768]:=

```
x^2 + x +
```

Out[768]=

```
1 + f[1
```

```
/.
```

In[770]:=

```
x + 3 /.
```

Out[770]=

```
{1, 3}
```

ReplaceAll (/.) – Wolfram Mathematica

SEARCH ref/ReplaceAll

Mathematica > Core Language > Rules & Patterns > Rules > ReplaceAll (/.) >

MORE INFORMATION

- ReplaceAll looks at each part of *expr*, tries all the *rules* on it, and then goes on to the next part of *expr*. The first rule that applies to a particular part is used; no further rules are tried on that part, or on any of its subparts.
- ReplaceAll applies a particular rule only once to an expression.
- *expr* /. *rules* returns *expr* if none of the rules apply.

EXAMPLES

Basic Examples (3)

```
In[1]:= {x, x^2, y, z} /. x -> a
Out[1]= {a, a^2, y, z}

In[2]:= {x, x^2, y, z} /. x -> {a, b}
Out[2]= {{a, b}, {a^2, b^2}, y, z}

In[3]:= Sin[x] /. Sin -> Cos
Out[3]= Cos[x]

In[1]:= 1 + x^2 + x^4 /. x^p_ -> f[p]
Out[1]= 1 + f[2] + f[4]

In[1]:= x /. {x -> 1, x -> 3, x -> 7}
Out[1]= 1

In[2]:= x /. {{x -> 1}, {x -> 3}, {x -> 7}}
Out[2]= {1, 3, 7}
```

Generalizations & Extensions (3)

```
In[1]:= {a, b, c} /. List -> f
Out[1]= f[a, b, c]
```

100%

Untitled-8

Substitu

In[768]:=

$x^2 + x +$

Out[768]=

1 + f[1

/.

_.

In[770]:=

x + 3 /.

Optional (:) – Wolfram Mathematica

SEARCH ref/Optional

Mathematica > Core Language > Rules & Patterns > Patterns > Optional (:) >

p : *v*
is a pattern object which represents an expression of the form *p*, which, if omitted, should be replaced by *v*.

MORE INFORMATION

EXAMPLES

Basic Examples (1)

In[1]:= f[x_, y_: 0] := {x, y}

Use the function with both arguments specified explicitly:

In[2]:= f[a, b]
Out[2]= {a, b}

The second argument is now taken to have its default value:

In[3]:= f[a]
Out[3]= {a, 0}

SEE ALSO

Default · Alternatives · PatternSequence · Shortest · BlankNullSequence · StringExpression

TUTORIALS

- Patterns and Transformation Rules
- Optional and Default Arguments

MORE ABOUT

- Patterns
- Defining Variables and Functions

New in 1

100%

Tuesday Morning Part 2.nb

```
Diamonds = Style[◇, {Red, Large}];
Spades = Style[♠, Large];
```

```
deck = # /@ Flatten[{Ace, Range[2, 10], Jacks, Queen, King}] & /@
    {Hearts, Spades, Diamonds, Clubs} // Flatten;
```

```
Shuffle := (shuffledDeck = RandomSample[deck];)
take[n_] := (
  temp = shuffledDeck[[1 ;; n]];
  shuffledDeck = Drop[shuffledDeck, n];
  temp)
```

Poker

```
Shuffle
{{"Player 1:", take[2]}, {"Player 2:", take[2]}} // TableForm
```

Player 1:	♠ [8] ♠ [Queen]
Player 2:	♠ [3] ◇ [King]

Tuesday Morning Part 2.nb

```
Diamonds = Style[◇, {Red, Large}];
Spades = Style[♠, Large];
```

```
deck = # /@ Flatten[{Ace, Range[2, 10], Jacks, Queen, King}] & /@
    {Hearts, Spades, Diamonds, Clubs} // Flatten;
```

```
Shuffle := (shuffledDeck = RandomSample[deck];)
take[n_] := (
  temp = shuffledDeck[[1 ;; n]];
  shuffledDeck = Drop[shuffledDeck, n];
  temp)
```

Poker

```
Shuffle
{{"Player 1:", take[2]}, {"Player 2:", take[2]}} // TableForm
```

Player 1:	♠ [8] ♠ [Queen]
Player 2:	♠ [3] ◇ [King]

Untitled-8

```
{1, 3}
```

Blocks

```
take[n_] := (
  temp = shuffledDeck[[1 ;; n]];
  shuffledDeck = Drop[shuffledDeck, n];
  temp)
```

Untitled-8

```
{1, 3}
```

Blocks

```
take[n_] := (
  temp = shuffledDeck[[1 ;; n]];
  shuffledDeck = Drop[shuffledDeck, n];
  temp)
```

```
f[x_] := Block[{y, r}
```

Untitled-8

```
{1, 3}
```

Blocks

```
take[n_] := (
  temp = shuffledDeck[[1 ;; n]];
  shuffledDeck = Drop[shuffledDeck, n];
  temp)
```

```
f[x_] := Block[{y, r}, y = D[x, s]; r = 1 / y + y;
```

Untitled-8

```
f[Cos[s]]
```

Out[772]=

```
-Cos[s] + Cot[s] Csc[s]
```

In[774]:=

```
? y
```

```
Global`y
```

Untitled-8

```
f[Cos[s]]
```

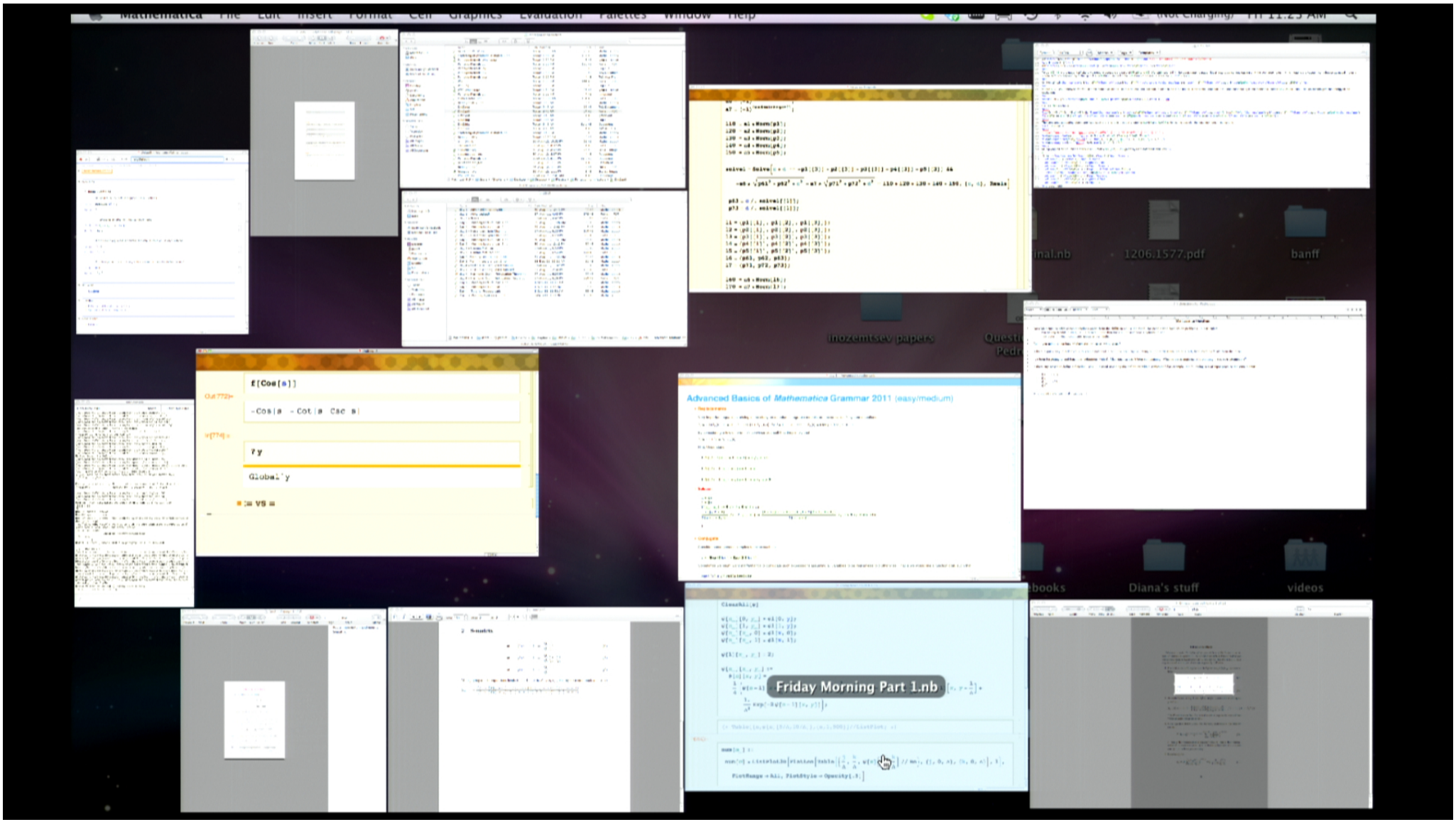
Out[772]=

```
-Cos[s] + Cot[s] Csc[s]
```

In[774]:=

```
? y
```

```
Global`y
```


Mathematica File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
1206.1577.pdf
banff
Inozemtsev papers
Advanced Basics of Mathematica Grammar 2011 (easy/medium)
books
Diana's stuff
videos
Friday Morning Part 1.nb

Friday Morning Part 1.nb

```
ClearAll[ψ]

ψ[n_][0, y_] = ϕ1[0, y];
ψ[n_][1, y_] = ϕ1[1, y];
ψ[n_][x_, 0] = ϕ1[x, 0];
ψ[n_][x_, 1] = ϕ1[x, 1];

ψ[1][x_, y_] = 2;

ψ[n_][x_, y_] :=
  ψ[n][x, y] =
   1/4 (ψ[n - 1][x + 1/Λ, y] + ψ[n - 1][x - 1/Λ, y] + ψ[n - 1][x, y + 1/Λ] + ψ[n - 1][x, y - 1/Λ] +
      1./Λ^2 Exp[-2 ψ[n - 1][x, y]]);

(* Table[{n,ψ[n][5/Λ,10/Λ]},{n,1,500}]//ListPlot; *)
```

In[755]:=

```
num[m_] :=
 num[m] = ListPlot3D[Flatten[Table[{j/Λ, k/Λ, ψ[m][j/Λ, k/Λ] // Re}, {j, 0, Λ}, {k, 0, Λ}], 1],
   PlotRange → All, PlotStyle → Opacity[.5]]
```

Untitled-8

```
? y
```

```
Global`y
```

:= vs =

In[776]:=

```
TrigExpand[Cos[2 x]]
```

Out[776]=

$$\text{Cos}[x]^2 - \text{Sin}[x]^2$$

```
f[x_] = Simplify[x];
```

```
f[x_] = TrigExpand[x] /. {Cos[x_] → c[x]
```

Untitled-8

In[776]:=

```
TrigExpand[Cos[2 x]]
```

Out[776]=

$$\mathrm{Cos}[x]^2 - \mathrm{Sin}[x]^2$$

In[780]:=

```
f[x_] = Simplify[x]
```

Out[780]=

```
x
```

In[779]:=

```
g[x_] := Simplify[x]
```

Untitled-8

Out[776]=

```
Cos[x]^2 - Sin[x]^2
```

In[781]:=

```
f[x_] = Simplify[x];
```

In[783]:=

```
g[x_] := Simplify[x]
```

In[784]:=

```
g[Cos[x]^2 + Sin[x]^2]
```

Out[784]=

```
1
```

Untitled-8

Out[776]=

```
Cos[x]^2 - Sin[x]^2
```

In[786]:=

```
f[x_] = Simplify[x]^2;
```

In[785]:=

```
g[x_] := Simplify[x]^2
```

In[787]:=

```
f[y]
```

Out[787]=

y^2

Untitled-8

Out[776]=

```
Cos[x]^2 - Sin[x]^2
```

In[788]:=

```
f[x_, y_] = Simplify[x/y]^2;
```

In[789]:=

```
f[x (x + 1) - x^2, y]
```

Out[789]=

$$\frac{\left(-x^2 + x\,(1 + x)\right)^2}{y^2}$$

In[786]:=

Untitled-8

Out[776]=

```
Cos[x]^2 - Sin[x]^2
```

In[788]:=

```
f[x_, y_] = Simplify[x/y]^2;
```

In[789]:=

```
f[x (x + 1) - x^2, y]
```

Out[789]=

$$\frac{\left(-x^2 + x\,(1 + x)\right)^2}{y^2}$$

In[786]:=

Untitled-8

In[789]:=

```
f[x (x + 1) - x^2, y]
```

Out[789]=

$$\frac{\left(-x^2 + x\,(1 + x)\right)^2}{y^2}$$

In[792]:=

```
f[x_] = FullSimplify[
  Cos[x]^2 + Sin[x]^2 + Tan[x]^2 + Cot[x]^2]
```

Out[792]=

$$\mathrm{Csc}[x]^2 + \mathrm{Tan}[x]^2$$

Out[789]=

$$\frac{\left(-x^2 + x\,(1 + x)\right)^2}{y^2}$$

In[795]:=

```
f[x_] = FullSimplify[
  Cos[x]^2 + Sin[x]^2 + Tan[x]^2 + Cot[x]^2]
```

Out[795]=

$$\mathrm{Csc}[x]^2 + \mathrm{Tan}[x]^2$$

```
f[x_] Csc[x]^2 + Tan[x]^2
```

In[794]:=

Untitled-8

```
Cos[x]^2 + Sin[x]^2 + Tan[x]^2 + Cot[x]^2]
```

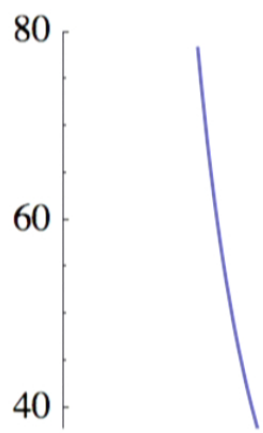
Out[800]=

```
Csc[x]^2 + Tan[x]^2
```

In[801]:=

```
Plot[f[x], {x, 0, 1}]
```

Out[801]=



Untitled-8

:= vs =

In[776]:=

```
TrigExpand[Cos[2 x]]
```

Out[776]=

$$\text{Cos}[x]^2 - \text{Sin}[x]^2$$

In[788]:=

$$f[x\_, y\_] = \text{Simplify}\left[\frac{x}{y}\right]^2;$$

In[789]:=

$$f\left[x\,(x+1) - x^2,\ y\right]$$

Out[789]=

Friday Morning Part 1.nb

New
Open... ⌘O
Open Recent
Close ⌘W
Save ⌘S
Save As... ⇧⌘S
Save Selection As...
Revert...
Install...
Printing Settings
Print... ⌘P
Print Selection... ⇧⌘P

Par erential Equations

- A

In[615]:=

```
Leq = ∂{x,2} ϕ[x, y] + ∂{y,2} ϕ[x, y] + Exp[-2 ϕ[x, y]];
```

In[616]:=

$$\phi 0[x\_, y\_] = \frac{1}{2} \text{Log}\left[\frac{(1 - g[x + I\, y]\, f[x - I\, y])^2}{4\, g'[x + I\, y]\, f'[x - I\, y]}\right];$$

In[617]:=

```
Leq //. ϕ → ϕ0 // FullSimplify
```

Out[617]=

0

In[665]:=

```
ϕ1[x_, y_] = ϕ0[x, y] /. {f → (1 + Exp[2 #] &), g → (1 + Exp[2 #] &)} // FullSimplify;
```

In[666]:=

```
analytic = Plot3D[ϕ1[x, y], {x, 0, 1}, {y, 0, 1}, PlotRange → All, PlotStyle → Red]
```

Untitled-8

```
1
```

```
f[
```

```
f[x_] = TrigExpand[x] /. {Cos[x_] → c[x]
```

In[802]:=

```
{{a, b, c}, {d, e, f}} >> "data.dat";
```

```
<<
```

Untitled-8

```
1
```

```
f[
```

```
f[x_] = TrigExpand[x] /. {Cos[x_] → c[x]
```

In[802]:=

```
{{a, b, c}, {d, e, f}} >> "data.dat";
```

In[803]:=

```
<< "data.dat"
```

Out[803]=

```
{{a, b, c}, {d, e, f}}
```

Untitled-8

In[804]:=

```
f[x_] := Block[{y, r},
  y = D[x, s];
  r = 1 / y + y;
  {∂s r, ∂{s,2} r}]
```

In[805]:=

```
f[Cos[s]]
```

Out[805]=

$$\{-\mathrm{Cos}[s] + \mathrm{Cot}[s]\,\mathrm{Csc}[s],\ -\mathrm{Cot}[s]^2\,\mathrm{Csc}[s] - \mathrm{Csc}[s]^3 + \mathrm{Sin}[s]\}$$

In[772]:=

- Blocks
- := vs =
- Optional

In[807]:=

```
F[x_, r_: 1] = x + r;
```

In[808]:=

```
F[x]
```

Out[808]=

```
x
```

- Blocks
- := vs =
- Optional

In[810]:=

```
F[x_, r_: 1] = x + r;
```

In[812]:=

```
F[x, 5]
```

Out[812]=

```
5 + x
```

- := vs =
- Optiona

In[810]:=

```
F[x_,
```

In[812]:=

```
F[x, 5
```

Out[812]=

```
5 + x
```

```
_•
```

Default - Wolfram Mathematica

SEARCH ref/Default

Mathematica > Core Language > Rules & Patterns > Patterns > Default >

Default[f, i, n]
gives the default value for the ith argument out of a total of n arguments.

Default[f, ...] = val
defines default values for arguments of f.

MORE INFORMATION

EXAMPLES

Basic Examples (1)

Define 0 to be the default argument for a function f:

```
In[1]:= Default[f] = 0
Out[1]= 0
```

_. represents an argument that can be omitted:

```
In[2]:= f[x_., y_.] = {x, y}
Out[2]= {x, y}
```

If the second argument is omitted, the default value of 0 is used instead:

```
In[3]:= f[a]
Out[3]= {a, 0}
```

If both arguments are omitted, both are taken to have the default value 0:

```
In[4]:= f[]
Out[4]= {0, 0}
```

SEE ALSO

Options

100%

- := vs =
- Optional

In[810]:=

```
F[x_, r_: 1] = x + r;
```

In[812]:=

```
F[x, 5]
```

Out[812]=

```
5 + x
```

```
x^a_.
```

Untitled-8

In[812]:=

```
F[x, 5]
```

Out[812]=

$5 + x$

$x^{a\_:1}$

In[814]:=

```
Power[x, 2]
```

Out[814]=

x^2

Untitled-8

- := vs =
- Optional
-

Untitled-8

Chop

In[820]:=

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
   1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] ==
 1.2588009378958716`
```

Out[820]=

```
True
```

Untitled-8

Chop

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
  1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}]
```

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
 Chop
```

Out[822]=

$9.37896 \times 10^{-7} + 0.\,i$

```
Chop[
```

Untitled-8

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, -5, 5}] -
  4.38392722539939` // Chop
```

Out[826]=

0

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
 Chop[#
```

Out[827]=

9.37896×10^{-7}

```
Chop[
```

Untitled-8

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, -5, 5}] -
  4.38392722539939` // Chop
```

Out[826]=

```
0
```

In[829]:=

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
 Chop[#, 10^-6] &
```

Out[829]=

```
0
```

```
Chop[
```

Subscripts

In[830]:=

```
f0[x_] = x^2
```

Out[830]=

x^2

```
fz[x]
```

Out[836]//FullForm=

```
Subscript[f, z][x]
```

```
D[f1[x], x]
```

Untitled-8

- Chop
- Subscripts

In[839]:=

```
f_z[x] // FullForm
```

Out[839]//FullForm=

```
Subscript[f, z][x]
```

In[838]:=

```
D[f_z[x], z]
```

Out[838]=

```
Subscript^(0,1)[f, z][x]
```

Untitled-8

- Chop
- Subscripts
- Series

```
Series[1/(1 + λ x + λ y), {λ, 0, 10}
```

In[841]:=

```
Series[1/(1 + x + y), {x, 0, 10}, {y, 0, 10}]
```

Out[841]=

$$\left(1 - y + y^2 - y^3 + y^4 - y^5 + y^6 - y^7 + y^8 - y^9 + y^{10} + O[y]^{11}\right) + \left(-1 + 2y - 3y^2 + 4y^3 - 5y^4 + 6y^5 - 7y^6 + 8y^7 - 9y^8 + 10y^9 - 11y^{10} + O[y]^{11}\right) x +$$

Untitled-8

Series

```
1/(1 + x + x y) /. {x → λ x, y → λ y} // Series[# $
```

Out[843]=

$$\frac{1}{1 + x + x\,y}$$

```
Series[1/(1 + x + x y), {λ, 0, 10}]
```

Out[842]=

$$1 + (-x - y)\,\lambda + (x + y)^2\,\lambda^2 - (x + y)^3\,\lambda^3 + (x + y)^4\,\lambda^4 - (x + y)^5\,\lambda^5 + (x + y)^6\,\lambda^6 - (x + y)^7\,\lambda^7 +$$

Untitled-8

Series

In[846]:=

```
(1/(1 + x + x y) /. {x → λ x, y → λ y} //
    Series[#, {λ, 0, 10}] & // Normal) /. λ → 1
```

Out[846]=

$$1 - x + x^2 - x^3 + x^4 - x^5 + x^6 - x^7 + x^8 - x^9 + x^{10} - x\,y + 2\,x^2\,y - 3\,x^3\,y + 4\,x^4\,y - 5\,x^5\,y + 6\,x^6\,y - 7\,x^7\,y + 8\,x^8\,y - 9\,x^9\,y + x^2\,y^2 - 3\,x^3\,y^2 + 6\,x^4\,y^2 - 10\,x^5\,y^2 + 15\,x^6\,y^2 - 21\,x^7\,y^2 + 28\,x^8\,y^2 - x^3\,y^3 + 4\,x^4\,y^3 - 10\,x^5\,y^3 + 20\,x^6\,y^3 - 35\,x^7\,y^3 + x^4\,y^4 - 5\,x^5\,y^4 + 15\,x^6\,y^4 - x^5\,y^5$$

Untitled-8

$$1 - x + x^2 - x^3 + x^4 - x^5 + x^6 - x^7 + x^8 - x^9 + x^{10} - x\,y + 2\,x^2\,y - 3\,x^3\,y + 4\,x^4\,y - 5\,x^5\,y + 6\,x^6\,y - 7\,x^7\,y + 8\,x^8\,y - 9\,x^9\,y + x^2\,y^2 - 3\,x^3\,y^2 + 6\,x^4\,y^2 - 10\,x^5\,y^2 + 15\,x^6\,y^2 - 21\,x^7\,y^2 + 28\,x^8\,y^2 - x^3\,y^3 + 4\,x^4\,y^3 - 10\,x^5\,y^3 + 20\,x^6\,y^3 - 35\,x^7\,y^3 + x^4\,y^4 - 5\,x^5\,y^4 + 15\,x^6\,y^4 - x^5\,y^5$$

Package

In[847]:=

```
? Get
```

<< *name* reads in a file, evaluating each expression in it, and returning the last one. >>

Untitled-8

$$1 - x + x^2 - x^3 + x^4 - x^5 + x^6 - x^7 + x^8 - x^9 + x^{10} - x\,y + 2\,x^2\,y - 3\,x^3\,y + 4\,x^4\,y - 5\,x^5\,y + 6\,x^6\,y - 7\,x^7\,y + 8\,x^8\,y - 9\,x^9\,y + x^2\,y^2 - 3\,x^3\,y^2 + 6\,x^4\,y^2 - 10\,x^5\,y^2 + 15\,x^6\,y^2 - 21\,x^7\,y^2 + 28\,x^8\,y^2 - x^3\,y^3 + 4\,x^4\,y^3 - 10\,x^5\,y^3 + 20\,x^6\,y^3 - 35\,x^7\,y^3 + x^4\,y^4 - 5\,x^5\,y^4 + 15\,x^6\,y^4 - x^5\,y^5$$

Package

In[847]:=

```
? Get
```

<< *name* reads in a file, evaluating each expression in it, and returning the last one. >>

Running...Untitled-8

expression in it, and returning the last one. >>

In[855]:=

```
Monitor[Table[FactorInteger[2^n + 1], {n, 100, 200}],
 ProgressIndicator[n, {100, 200}]]
```

Running...Untitled-8

expression in it, and returning the last one. >>

In[855]:=

```
Monitor[Table[FactorInteger[2^n + 1], {n, 100, 200}],
 ProgressIndicator[n, {100, 200}]]
```

Untitled-8

```
Monitor[Table[FactorInteger[2^n + 1], {n, 100, 200}],
 ProgressIndicator[n, {100, 200}]]
```

- **White spaces**

```
x      y //
```

Untitled-8

```
x    y // FullForm
```

Out[856]//FullForm=

```
Times[x, y]
```

In[857]:=

```
y // x
```

Out[857]=

```
x[y]
```

```
y / /x
```

```
f [x_]
```

Untitled-8

```
y / /x
```

```
y [x_]
```

Out[862]//FullForm=

```
y[Pattern[x, Blank[]]]
```

In[859]:=

```
f [x_] = 2 x
```

Out[859]=

```
2 x
```

In[860]:=

```
f[6]
```

Untitled-8

```
y / / x
```

In[859]:=

```
f [x_] = 2 x
```

Out[859]=

```
2 x
```

In[860]:=

```
f[6]
```

Out[860]=

```
12
```

In[872]:=

```
KroneckerProduct[{{a, b}, {c, d}},
  {{α, β}, {χ, δ}}] // MatrixForm
```

Out[872]//MatrixForm=

$$\begin{pmatrix} a\,\alpha & a\,\beta & b\,\alpha & b\,\beta \\ a\,\chi & a\,\delta & b\,\chi & b\,\delta \\ c\,\alpha & c\,\beta & d\,\alpha & d\,\beta \\ c\,\chi & c\,\delta & d\,\chi & d\,\delta \end{pmatrix}$$

```
Circle
```

```
M1 = {{a, b}, {c, d}};
M2 = {{α, β}, {χ, δ}};
M1 ⊗ M2 // MatrixForm
```

Untitled-8

- White spaces
- Centerdot et al
- Parellize
- Unpercent

Untitled-8

- Subscripts
- Series
- White spaces
- Centerdot et al
- Parellize
- Unpercent

```
# &
```

Untitled-8

In[879]:=

```
chop[x_] := Chop[x, 10^-6];
```

In[881]:=

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
     1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
  chop;
```

In[882]:=

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
 Chop[#, 10^-6] &
```

Out[882]=

```
0
```

In[879]:=

```
chop[x_] := Chop[x, 10^-6];
```

In[881]:=

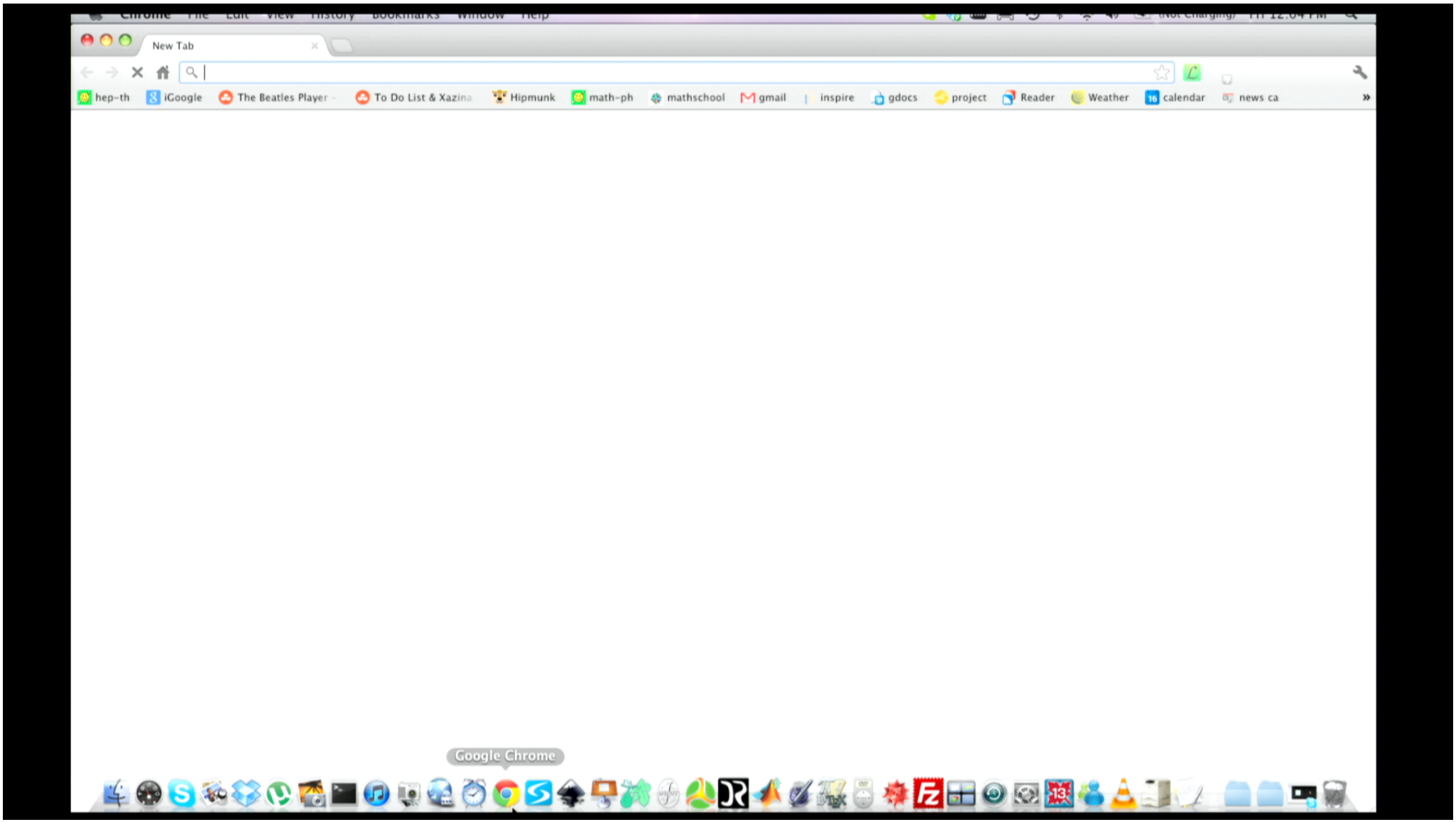
```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
     1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
  chop;
```

In[882]:=

```
NIntegrate[1 / (Exp[I x] + Cos[-I x]) +
    1 / (Exp[-I x] + Cos[I x]), {x, 1, 5}] - 1.2588 //
 Chop[#, 10^-6] &
```

Out[882]=

```
0
```


Chrome File Edit View History Bookmarks Window Help
New Tab
hep-th
iGoogle
The Beatles Player
To Do List & Xazina
Hipmunk
math-ph
mathschool
gmail
inspire
gdocs
project
Reader
Weather
calendar
news ca
Google Chrome

Friday Morning Part 2.nb

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