Untitled1

December 16, 2019

[1]:
```
import sympy as sp
sp.init_printing()
```

[2]:
```
M = sp.Matrix([[1.25, 1.50], [1.50, 5.25]])
M.eigenvals()
```

[2]:

$$\left\{ \frac{3}{4} : 1, \ \frac{23}{4} : 1 \right\}$$

[3]:
```
M.eigenvects()
```

[3]:

$$\left[\left(0.75, \ 1, \ \left[\left[\begin{matrix} -3.0 \\ 1.0 \end{matrix} \right] \right] \right), \ \left(5.75, \ 1, \ \left[\left[\begin{matrix} 0.333333333333333 \\ 1.0 \end{matrix} \right] \right] \right) \right]$$

[4]:
```
M = sp.Matrix([[60.000000, 4.689758],
[4.689758, 19.063202]])
[sp.N(eig) for eig in M.eigenvals().keys()]
```

[4]:

$$[18.5328108509994, \ 60.5303911490006]$$

[8]:
```
alpha, alpha_h, beta, beta_h, p, S = sp.symbols('beta_0, alpha_h, beta_1,␣
↪beta_h, p, S^2')
X = sp.Matrix([alpha_h-alpha, beta_h-beta])
f = X.transpose() * M * X/(p*S)
display(f[0])
f = f.subs({alpha_h : 1.0321764, beta_h : 0.1904323, p : 2, S : 0.098341450})[0]
sp.expand(f)
```

$$\frac{(\alpha_h - \beta_0)(60.0\alpha_h - 60.0\beta_0 - 4.689758\beta_1 + 4.689758\beta_h) + (-\beta_1 + \beta_h)(4.689758\alpha_h - 4.689758\beta_0 - 19.063202\beta_1 +}{S^2 p}$$

[8]:

$$305.059565422312\beta_0^2 + 47.6885179138603\beta_0\beta_1 - 638.83200219626\beta_0 + 96.9235352946291\beta_1^2 - 86.1377062422387\beta_1 + 337.895358874081$$

[9]:
```
print(sp.latex(sp.expand(f)))
```

```
305.059565422312 \beta_{0}^{2} + 47.6885179138603 \beta_{0} \beta_{1} -
638.83200219626 \beta_{0} + 96.9235352946291 \beta_{1}^{2} - 86.1377062422387
\beta_{1} + 337.895358874081
```