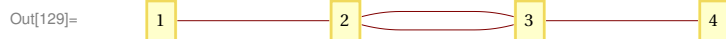# PageRank Linear Algebra Formulation

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The Example Graph

In[128]:=
```
n = 4;
GraphPlot[{1 -> 2, 2 -> 3, 3 -> 4, 3 -> 2}, VertexLabeling -> True]
```

Out[129]=

The Stochastic Adjacency/Transition Matrix: M

In[130]:=
```
M = {{0,0,0,0},{1,0,1/2,1},{0,1,0,0},{0,0,1/2,0}};
```

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & \frac{1}{2} & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 \end{pmatrix}$$

The Dampening Factor

In[131]:=
```
d = 0.85;
```

The initial Distribution

In[132]:=
```
PR0 = {1/n,1/n,1/n,1/n};
```

$$\begin{pmatrix} \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \end{pmatrix}$$

The Teleportation Vector

In[133]:= `P = {(1-d)/n,(1-d)/n,(1-d)/n,(1-d)/n};`

$$\begin{pmatrix} 0.0375 \\ 0.0375 \\ 0.0375 \\ 0.0375 \end{pmatrix}$$

The Iterative Formula

$$PR_{i+1} = dM \cdot PR_i + P$$

The Iterative Formula

In[152]:=
```
iterations = 50;
PRI = PR0;
For[i=0,i<iterations,i++,PRI =((d*M).PRI) + P];
PR = PRI;
```

PageRank for our graph:

$$\begin{pmatrix} 0.0375 \\ 0.394149 \\ 0.372527 \\ 0.195824 \end{pmatrix}$$

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12/10-2017