

## 1 Forward Step: Example 1

The matrix is currently:

```
[[ 0.  0.  1.  0.  2.]
 [ 1.  0.  2.  3.  4.]
 [ 3.  0.  4.  2.  1.]
 [ 1.  0.  1.  1.  2.]]
```

Now looking at row 0

Swapping rows 0 and 1 so that entry 0 in the current row is non-zero

The matrix is currently:

```
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 3.  0.  4.  2.  1.]
 [ 1.  0.  1.  1.  2.]]
```

Adding row 0 to rows below it to eliminate coefficients in column 0

The matrix is currently:

```
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0. -2. -7. -11.]
 [ 0.  0. -1. -2. -2.]]
```

Now looking at row 1

Swapping rows 1 and 1 so that entry 2 in the current row is non-zero

The matrix is currently:

```
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0. -2. -7. -11.]
 [ 0.  0. -1. -2. -2.]]
```

Adding row 1 to rows below it to eliminate coefficients in column 2

The matrix is currently:

```
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0.  0. -7. -7.]
 [ 0.  0.  0. -2.  0.]]
```

Now looking at row 2

Swapping rows 2 and 2 so that entry 3 in the current row is non-zero

The matrix is currently:

```
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0.  0. -7. -7.]
 [ 0.  0.  0. -2.  0.]]
```

Adding row 2 to rows below it to eliminate coefficients in column 3

The matrix is currently:

```
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0.  0. -7. -7.]
 [ 0.  0.  0.  0.  2.]]
```

```
=====
Now looking at row 3
Swapping rows 3 and 3 so that entry 4 in the current row is non-zero
The matrix is currently:
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0.  0. -7. -7.]
 [ 0.  0.  0.  0.  2.]]
Adding row 3 to rows below it to eliminate coefficients in column 4
The matrix is currently:
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0.  0. -7. -7.]
 [ 0.  0.  0.  0.  2.]]
=====
```

```
Done with the forward step
The matrix is currently:
[[ 1.  0.  2.  3.  4.]
 [ 0.  0.  1.  0.  2.]
 [ 0.  0.  0. -7. -7.]
 [ 0.  0.  0.  0.  2.]]
```

## 2 Forward Step and Backward Step: Example 2

The matrix is currently:

```
[[ 1 -2  3 22]
 [ 3 10  1 314]
 [ 1  5  3 92]]
```

Now performing the forward step

Now looking at row 0

Swapping rows 0 and 0 so that entry 0 in the current row is non-zero

The matrix is currently:

```
[[ 1 -2  3 22]
 [ 3 10  1 314]
 [ 1  5  3 92]]
```

Adding row 0 to rows below it to eliminate coefficients in column 0

The matrix is currently:

```
[[ 1. -2.  3. 22.]
 [ 0. 16. -8. 248.]
 [ 0.  7.  0. 70.]]
```

Now looking at row 1

Swapping rows 1 and 1 so that entry 1 in the current row is non-zero

The matrix is currently:

```
[[ 1. -2.  3. 22.]
 [ 0. 16. -8. 248.]
 [ 0.  7.  0. 70.]]
```

Adding row 1 to rows below it to eliminate coefficients in column 1

The matrix is currently:

```
[[ 1. -2.  3. 22. ]
 [ 0. 16. -8. 248. ]
 [ 0.  0.  3.5 -38.5]]
```

Now looking at row 2

Swapping rows 2 and 2 so that entry 2 in the current row is non-zero

The matrix is currently:

```
[[ 1. -2.  3. 22. ]
 [ 0. 16. -8. 248. ]
 [ 0.  0.  3.5 -38.5]]
```

Adding row 2 to rows below it to eliminate coefficients in column 2

The matrix is currently:

```
[[ 1. -2.  3. 22. ]
 [ 0. 16. -8. 248. ]
 [ 0.  0.  3.5 -38.5]]
```

The matrix is currently:

```
[[ 1.  -2.   3.  22. ]
 [ 0.  16.  -8. 248. ]
 [ 0.   0.   3.5 -38.5]]
```

=====

Now performing the backward step

Adding row 2 to rows above it to eliminate coefficients in column 2

The matrix is currently:

```
[[ 1.  -2.   0.  55. ]
 [ 0.  16.   0. 160. ]
 [ 0.   0.   3.5 -38.5]]
```

=====

Adding row 1 to rows above it to eliminate coefficients in column 1

The matrix is currently:

```
[[ 1.   0.   0.  75. ]
 [ 0.  16.   0. 160. ]
 [ 0.   0.   3.5 -38.5]]
```

=====

Adding row 0 to rows above it to eliminate coefficients in column 0

The matrix is currently:

```
[[ 1.   0.   0.  75. ]
 [ 0.  16.   0. 160. ]
 [ 0.   0.   3.5 -38.5]]
```

=====

Now dividing each row by the leading coefficient

The matrix is currently:

```
[[ 1.  0.  0. 75.]
 [ 0.  1.  0. 10.]
 [ 0.  0.  1. -11.]]
```