

## Korrekturen

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Korrektur der Gleichungen 3.1.2

$$\begin{aligned}
 x_1 &: 4x_1 - x_2 - x_6 = 24 \\
 x_2 &: -x_1 + 4x_2 - x_3 - x_7 = 18 \\
 x_3 &: -x_2 + 4x_3 - x_4 - x_8 = 24 \\
 x_4 &: -x_3 + 4x_4 - x_5 - x_9 = 36 \\
 x_5 &: -x_4 + 4x_5 - x_{10} = 84 \\
 x_6 &: -x_1 + 4x_6 - x_7 - x_{11} = 22 \\
 x_7 &: -x_2 - x_6 + 4x_7 - x_8 - x_{12} = 0 \\
 x_8 &: -x_3 - x_7 + 4x_8 - x_9 - x_{13} = 0 \\
 x_9 &: -x_4 - x_8 + 4x_9 - x_{10} - x_{14} = 0 \\
 x_{10} &: -x_5 - x_9 + 4x_{10} - x_{15} = 30 \\
 x_{11} &: -x_6 + 4x_{11} - x_{12} = 34 \\
 x_{12} &: -x_7 - x_{11} + 4x_{12} - x_{13} = 24 \\
 x_{13} &: -x_8 - x_{12} + 4x_{13} - x_{14} = 32 \\
 x_{14} &: -x_9 - x_{13} + 4x_{14} - x_{15} = 24 \\
 x_{15} &: -x_{10} - x_{14} + 4x_{15} = 32
 \end{aligned} \tag{3.1.2}$$

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Im Kapitel 4.3 sind die Einheiten im Diagramm in Meter und nicht in mm anzugeben. Die Änderung ist im Quellcode vorzunehmen:

```

Sub Zeige_Querschnittsverlauf()
    Range("D3:E52").Select
    Charts.Add
    ActiveChart.ChartType = xlXYScatterSmoothNoMarkers
    ActiveChart.SetSourceData Source:= _
        Sheets("Konstante Zugspannung").Range("D3:E52"), _
        PlotBy:=xlColumns

```

## Fehler! Kein Text mit angegebener Formatvorlage im Dokument.

```
ActiveChart.SeriesCollection(1).Name = _
    ="Querschnittsverlauf""
ActiveChart.Location Where:= _
    xlLocationAsObject, Name:="Konstante Zugspannung"
With ActiveChart
    .HasTitle = True
    .ChartTitle.Characters.Text = _
        "Träger mit konstanter Spannung"
    .Axes(xlCategory, xlPrimary).HasTitle = True
    .Axes(xlCategory, _
        xlPrimary).AxisTitle.Characters.Text = "x [m]"
    .Axes(xlValue, xlPrimary).HasTitle = True
    .Axes(xlValue, _
        xlPrimary).AxisTitle.Characters.Text = "A [m^2]"
End With
ActiveChart.Legend.Select
Selection.Left = 229
Selection.Top = 274
ActiveChart.Axes(xlValue).MajorGridlines.Select
ActiveChart.PlotArea.Select
Selection.Width = 314
ActiveWindow.Visible = False
End Sub

Sub Lösche_Querschnittsverlauf()
    Dim Shp As Shape
    For Each Shp In Worksheets("Konstante Zugspan-
nung").Shapes
        Shp.Delete
    Next
End Sub
```

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### Code 4-2 Interpolation mittels kubischer Splines

```
Option Explicit

Sub Splines_Leer()
    ThisWorkbook.Worksheets("Kubische Splines").Cells.Clear
    Cells(1, 1) = "x"
    Cells(1, 2) = "y=a"
    Cells(1, 3) = "b"
    Cells(1, 4) = "c"
```

```
Cells(1, 5) = "d"
Cells(1, 8) = "x"
Cells(1, 9) = "y"
Range("A:I").Select
Selection.NumberFormat = "0.00"
Range("A1:I1").Select
Selection.Font.Bold = True
Selection.Font.Italic = True
End Sub

Sub Splines_Testdaten()
Cells(2, 1) = 0: Cells(2, 2) = 30
Cells(3, 1) = 10: Cells(3, 2) = 18
Cells(4, 1) = 20: Cells(4, 2) = 11.5
Cells(5, 1) = 30: Cells(5, 2) = 10
Cells(6, 1) = 35: Cells(6, 2) = 10.5
Cells(7, 1) = 40: Cells(7, 2) = 12.5
Cells(8, 1) = 50: Cells(8, 2) = 20

' Cells(2, 1) = -1: Cells(2, 2) = 0.5
' Cells(3, 1) = -0.5: Cells(3, 2) = 0.8
' Cells(4, 1) = 0: Cells(4, 2) = 1
' Cells(5, 1) = 0.5: Cells(5, 2) = 0.8
' Cells(6, 1) = 1: Cells(6, 2) = 0.5
End Sub

Sub Splines_Auswertung()
Dim i, j, k, n As Integer
Dim f1, f2, q, S, x, y, hx As Double
,
'Bestimmung belegter Zeilen
'und Definition der notwendigen Datenfelder
Cells(Rows.Count, 1).End(xlUp).Select
n = ActiveCell.Row - 1
ReDim e(n, 2), h(n - 1), m(n, n + 1), c(n), b(n), D(n)
As Double

'Indexbelegung für M
'1 = x
'2 = y = a

'Daten lesen
For i = 1 To n
For j = 1 To 2
e(i, j) = Cells(i + 1, j)
Next j
```

```
Next i

'Bestimmung der Differenzen
For i = 1 To n - 1
    h(i) = e(i + 1, 1) - e(i, 1)
Next i

'Bestimmung der Matrix
For i = 1 To n - 2
    For j = 1 To n - 2
        m(i, j) = 0
    Next j
Next i
For i = 2 To n - 1
    m(i - 1, i - 2) = h(i - 1)
    m(i - 1, i - 1) = 2 * (h(i - 1) + h(i))
    m(i - 1, i) = h(i)
    f1 = 3 / h(i) * (e(i + 1, 2) - e(i, 2))
    f2 = 3 / h(i - 1) * (e(i, 2) - e(i - 1, 2))
    m(i - 1, n - 1) = f1 - f2
Next i

'Ausgabe der Gleichungsmatrix
Cells(n + 3, 1) = "Gl.Matrix"
Cells(n + 3, 1).Select
Selection.Font.Bold = True
Selection.Font.Italic = True
For i = 1 To n - 2
    For j = 1 To n - 1
        Cells(i + n + 3, j) = m(i, j)
    Next j
Next i

'Dreiecksteilung
For i = 1 To n - 2
    For j = i + 1 To n - 2
        q = m(j, i) / m(i, i)
        m(j, i) = 0
        For k = i + 1 To n - 1
            m(j, k) = m(j, k) - q * m(i, k)
        Next k
    Next j
Next i

'Rückwärtssubstitution
c(1) = 0
```

```

c(n - 1) = 0
Cells(2, 4) = 0
Cells(n, 4) = 0
For i = n - 2 To 1 Step -1
    S = m(i, n - 1)
    For k = i + 1 To n - 2
        S = S - m(i, k) * c(k + 1)
    Next k
    c(i + 1) = S / m(i, i)
    Cells(i + 2, 4) = c(i + 1)
Next i

'Bestimmung der b Koeffizienten
For i = 1 To n - 1
    b(i) = 1 / h(i) * (e(i + 1, 2) - e(i, 2)) - h(i) _
        / 3 * (c(i + 1) + 2 * c(i))
    Cells(i + 1, 3) = b(i)
Next i

'Bestimmung der d Koeffizienten
For i = 1 To n - 1
    D(i) = 1 / 3 / h(i) * (c(i + 1) - c(i))
    Cells(i + 1, 5) = D(i)
Next i

'Funktionsverlauf
j = 1
For x = 0 To 49
    i = 0
    Do
        i = i + 1
    Loop While x >= e(i, 1)
    i = i - 1
    hx = x - e(i, 1)
    y = e(i, 2) + b(i) * hx + _
        c(i) * hx ^ 2 + D(i) * hx ^ 3
    j = j + 1
    Cells(j, 8) = x
    Cells(j, 9) = y
Next x
j = j + 1
Cells(j, 8) = 50
Cells(j, 9) = 20
End Sub

Sub Splines_Zeigen()

```

## Fehler! Kein Text mit angegebener Formatvorlage im Dokument.

```
Range("H2:I52").Select
Charts.Add
ActiveChart.ChartType = xlXYScatterSmoothNoMarkers
ActiveChart.SetSourceData Source:=Worksheets("Kubische
Splines").Range("H2:I52") _
, PlotBy:=xlColumns
ActiveChart.Location Where:=xlLocationAsObject,
Name:="Kubische Splines"
With ActiveChart
.HasTitle = True
.ChartTitle.Characters.Text = "Seilverlauf"
.Axes(xlCategory, xlPrimary).HasTitle = True
.Axes(xlCategory, xlPri-
mary).AxisTitle.Characters.Text = "Weite [m]"
.Axes(xlValue, xlPrimary).HasTitle = True
.Axes(xlValue, xlPrimary).AxisTitle.Characters.Text
= "Höhe [m]"
End With
ActiveChart.Legend.Select
Selection.Delete
End Sub
Sub Splines_Entfernen()
Dim Shp As Shape
For Each Shp In Worksheets("Kubische Splines").Shapes
Shp.Delete
Next
End Sub
```

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$$y'_i = \left( \frac{\Delta y}{\Delta x} \right)_i = \frac{y_{i+1} - y_{i-1}}{2h} \quad (6.3.2)$$

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Gleichungsnummer (6.3.7) statt (6.2.7)