```
thetas = {1.628814629,
1.598374576,
1.568798654,
1.547181935,
1.525301696,
1.478323485,
1.434171566,
1.379201972,
1.317838286,
1.26194459,
1.198314814,
1.135126452,
1.074120306,
1.018986493,
0.969829573,
0.905741116,
0.851885256,
0.779456873,
0.67633202,
0.600506019,
0.528325699,
0.463022288,
0.390050894}
```

```
{1.62881, 1.59837, 1.5688, 1.54718, 1.5253, 1.47832, 1.43417, 1.3792,
 1.31784, 1.26194, 1.19831, 1.13513, 1.07412, 1.01899, 0.96983, 0.905741,
 0.851885, 0.779457, 0.676332, 0.600506, 0.528326, 0.463022, 0.390051}
```

```
values = {n → 2.3104, a → 32.7557}
```

```
{n → 2.3104, a → 32.7557}
```

```
s = a theta^(1 / n) Hypergeometric2F1[-1 / 2, 1 / (2 n), 1 + 1 / (2 n), -n^2 theta^2]
```

$$a\,\text{theta}^{\frac{1}{n}}\,\text{Hypergeometric2F1}\left[-\frac{1}{2}, \frac{1}{2\,n}, 1+\frac{1}{2\,n}, -n^2\,\text{theta}^2\right]$$

```
s /. values /. theta → thetas // MatrixForm
s0 = %[[1]]
```

$$\begin{pmatrix} 67.9446 \\ 66.6748 \\ 65.4494 \\ 64.559 \\ 63.6623 \\ 61.7527 \\ 59.9774 \\ 57.7937 \\ 55.391 \\ 53.235 \\ 50.8182 \\ 48.4583 \\ 46.2176 \\ 44.2244 \\ 42.4726 \\ 40.2238 \\ 38.3643 \\ 35.9051 \\ 32.4792 \\ 30.0077 \\ 27.6809 \\ 25.5844 \\ 23.2277 \end{pmatrix}$$

67.9446

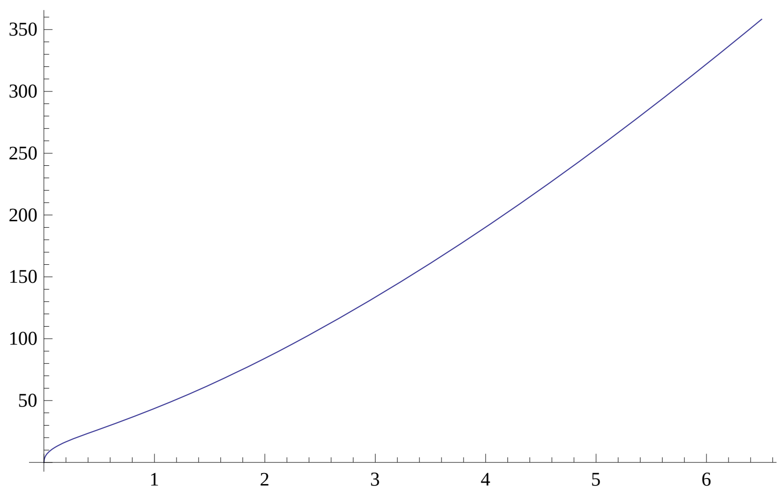
```
r = a (1 + n^2 theta^2) ^ (3 / 2) / (n theta^ (1 - 1 / n) (1 + n + n^2 theta^2))
```

$$\frac{a\,\text{theta}^{-1+\frac{1}{n}}\left(1+n^2\,\text{theta}^2\right)^{3/2}}{n\left(1+n+n^2\,\text{theta}^2\right)}$$

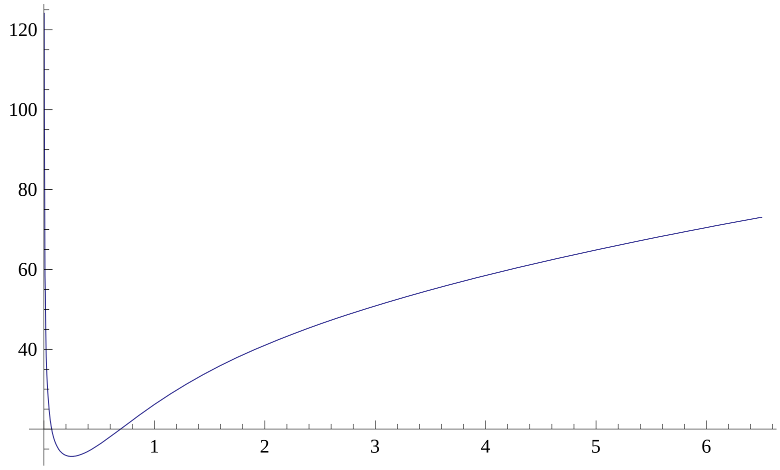
```
r /. values /. theta → thetas // MatrixForm
```

$$\begin{pmatrix} 36.3253 \\ 35.9055 \\ 35.4916 \\ 35.1852 \\ 34.8717 \\ 34.1867 \\ 33.5278 \\ 32.6859 \\ 31.7168 \\ 30.806 \\ 29.7352 \\ 28.6351 \\ 27.5375 \\ 26.5155 \\ 25.5808 \\ 24.3305 \\ 23.2546 \\ 21.7782 \\ 19.6455 \\ 18.0902 \\ 16.664 \\ 15.4665 \\ 14.3094 \end{pmatrix}$$

```
Plot[s /. values /. theta → x, {x, 0, 6.5}]
```



```
Plot[r /. values /. theta → x, {x, 0, 6.5}]
```




```
logvalues = {a → 2.3470, b → .4539}
```

{a → 2.347, b → 0.4539}

```
slog = a Sqrt[1 + b^2] Exp[b t] / b
```

$$\frac{a \sqrt{1 + b^2}\, e^{b t}}{b}$$

```
rlog = a Sqrt[1 + b^2] Exp[b t]
```

$$a \sqrt{1 + b^2}\, e^{b t}$$

```
tvalues = {5.949368226,
5.916305259,
5.883500689,
5.859614478,
5.834924816,
5.781015333,
5.729627125,
5.664809383,
5.590574456,
5.521592788,
5.440581862,
5.359524152,
5.278537577,
5.203598777,
5.134747049,
5.043009242,
4.963496788,
4.853631719,
4.69103705,
4.564607637,
4.436922348,
4.315018521,
4.168544148}
```

```
{5.94937, 5.91631, 5.8835, 5.85961, 5.83492, 5.78102, 5.72963,
 5.66481, 5.59057, 5.52159, 5.44058, 5.35952, 5.27854, 5.2036, 5.13475,
 5.04301, 4.9635, 4.85363, 4.69104, 4.56461, 4.43692, 4.31502, 4.16854}
```

```
slog /. logvalues /. t → tvalues // MatrixForm
s0log = %[[1]]
```

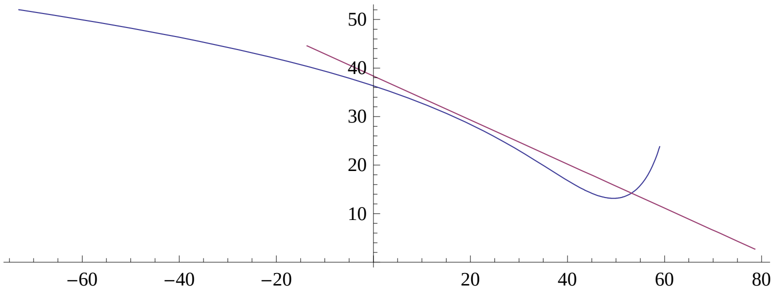
84.5294
83.2703
82.0396
81.155
80.2506
78.3107
76.5052
74.2872
71.8257
69.6117
67.0985
64.6746
62.3404
60.2556
58.4016
56.0197
54.0339
51.4055
47.7483
45.0853
42.5466
40.2564
37.667

84.5294

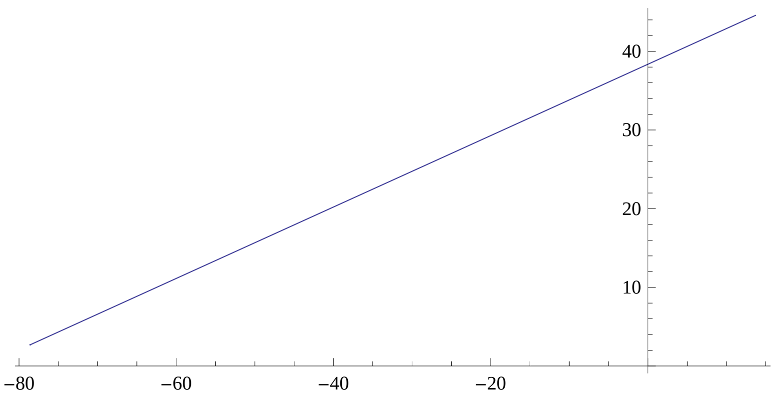
```
rlog /. logvalues /. t → tvalues // MatrixForm
```

38.3679
37.7964
37.2378
36.8362
36.4257
35.5452
34.7257
33.7189
32.6017
31.5967
30.456
29.3558
28.2963
27.35
26.5085
25.4273
24.526
23.3329
21.6729
20.4642
19.3119
18.2724
17.097

```
ParametricPlot[{{s0 - s /. values /. theta → x / 2, r /. values /. theta → x / 2},
  {s0log - slog /. logvalues /. t -> x, rlog /. logvalues /. t → x}}, {x, .1, 6.28}]
```




```
ParametricPlot[
 {{-s0log + slog /. logvalues /. t → x, rlog /. logvalues /. t → x}}, {x, .1, 6.28}]
```



```
thvalues = {0.5000,
0.5186,
0.5367,
0.5498,
0.5630,
0.5912,
0.6174,
0.6496,
0.6851,
0.7169,
0.7526,
0.7875,
0.8207,
0.8501,
0.8760,
0.9092,
0.9366,
0.9729,
1.0232,
1.0595,
1.0937,
1.1246,
1.1595}
```

```
{0.5, 0.5186, 0.5367, 0.5498, 0.563, 0.5912, 0.6174,
 0.6496, 0.6851, 0.7169, 0.7526, 0.7875, 0.8207, 0.8501, 0.876,
 0.9092, 0.9366, 0.9729, 1.0232, 1.0595, 1.0937, 1.1246, 1.1595}
```

```
rCloth = aCloth / Pi / th
```

$$\frac{\text{aCloth}}{\pi\,\text{th}}$$

```
sCloth = th * aCloth
```

```
aCloth th
```

```
rCloth /. aCloth → 75.678 /. th → thvalues // MatrixForm
```

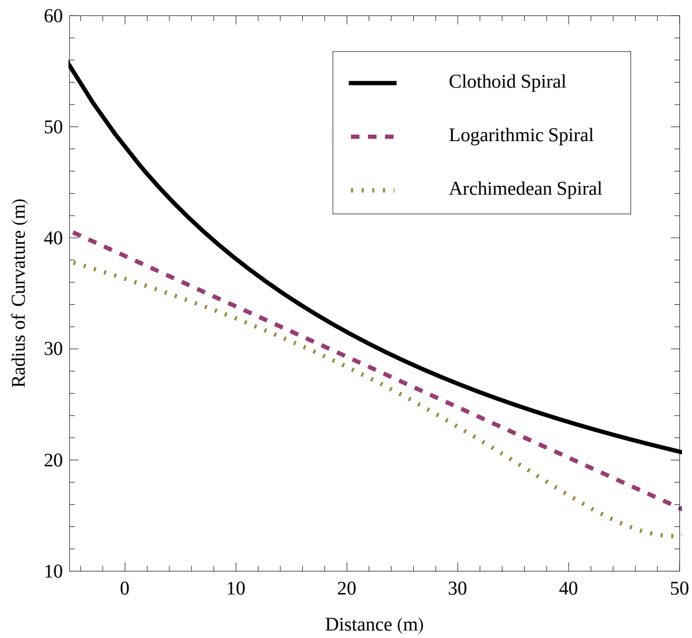
48.1781
46.4502
44.8837
43.8142
42.787
40.746
39.0169
37.0829
35.1614
33.6017
32.0078
30.5893
29.3518
28.3367
27.4989
26.4948
25.7197
24.7601
23.5429
22.7362
22.0253
21.4201
20.7754

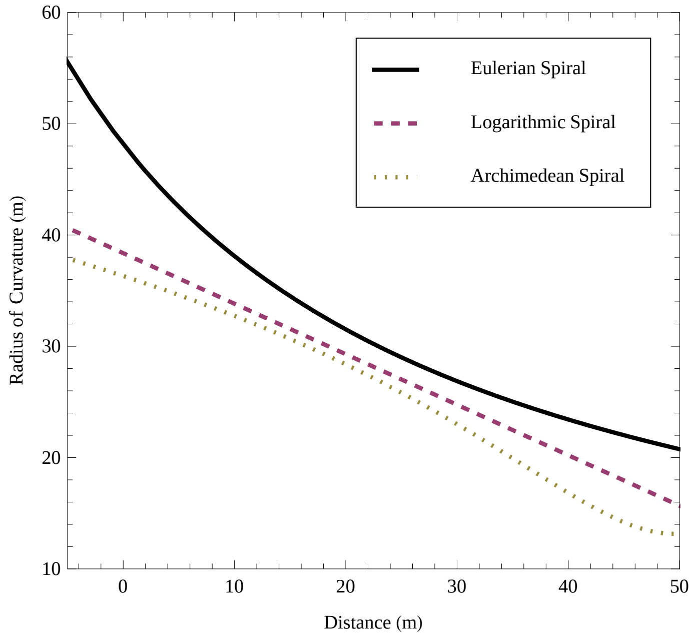
```
sCloth /. aCloth → 75.678 /. th → thvalues // MatrixForm
s0Cloth = %[[1]]
```

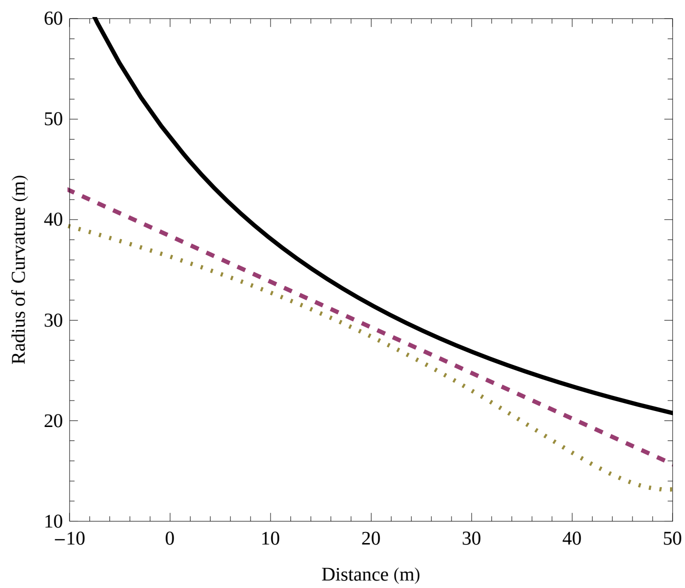
37.839
39.2466
40.6164
41.6078
42.6067
44.7408
46.7236
49.1604
51.847
54.2536
56.9553
59.5964
62.1089
64.3339
66.2939
68.8064
70.88
73.6271
77.4337
80.1808
82.769
85.1075
87.7486

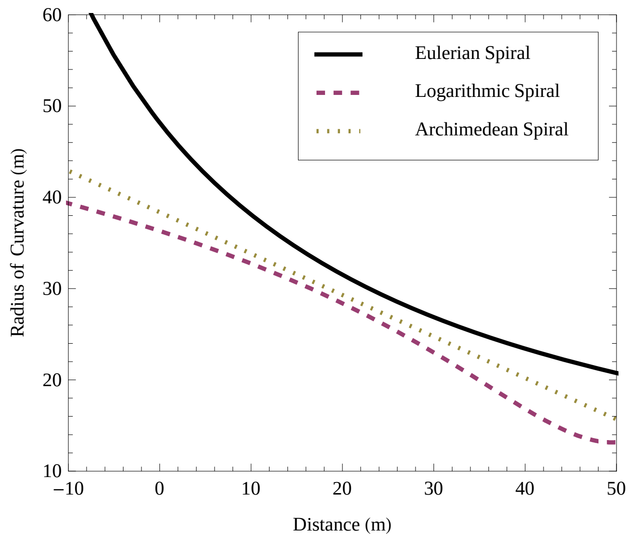
37.839

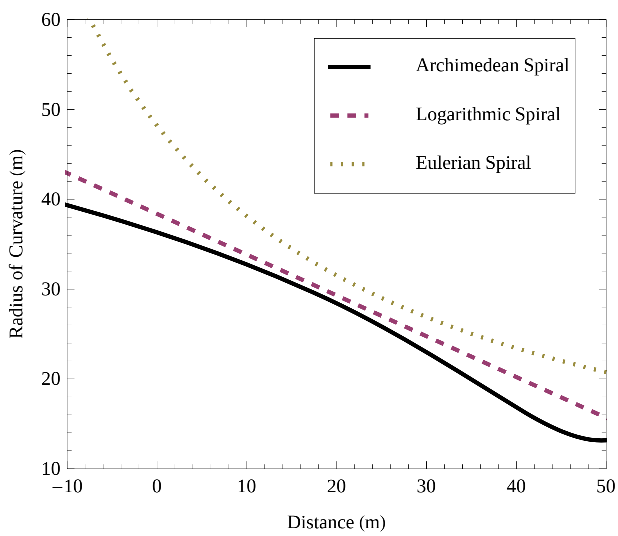
```
Needs["PlotLegends`"]

ParametricPlot[{{-s0Cloth + sCloth /. aCloth → 75.678 /. th -> x / 6,
   rCloth /. aCloth → 75.678 /. th → x / 6},
  {s0log - slog /. logvalues /. t -> x, rlog /. logvalues /. t → x},
  {s0 - s /. values /. theta → x / 2, r /. values /. theta → x / 2}},
 {x, .1, 8.28}, PlotRange → {{-5, 50}, {10, 60}},
 PlotStyle → {{Thick, Black}, {Thick, Dashed}, {Thick, Dotted}}, Frame -> True,
 FrameLabel → {"Distance (m)", "Radius of Curvature (m)"}, Axes → False,
 PlotLegend → {"Clothoid Spiral", "Logarithmic Spiral", "Archimedean Spiral"},
 LegendShadow → None]
```

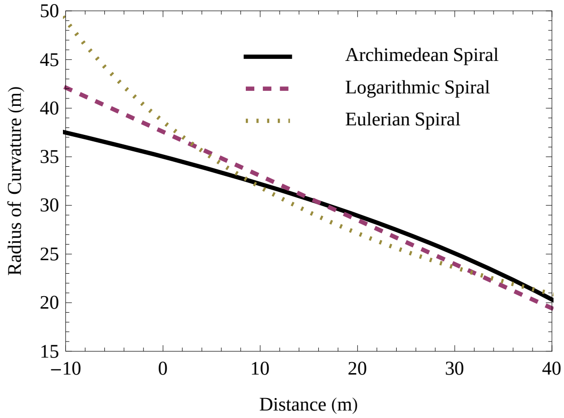


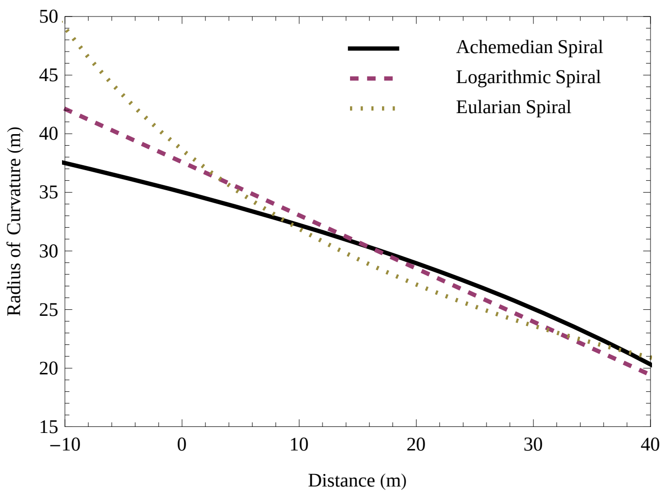

Eulerian Spiral
Logarithmic Spiral
Archimedean Spiral
Radius of Curvature (m)
Distance (m)
60
50
40
30
20
10
0
10
20
30
40
50


Radius of Curvature (m)
Distance (m)
60
50
40
30
20
10
−10
0
10
20
30
40
50


Eulerian Spiral
Logarithmic Spiral
Archimedean Spiral
Radius of Curvature (m)
Distance (m)
60
50
40
30
20
10
−10
0
10
20
30
40
50


Archimedean Spiral
Logarithmic Spiral
Eulerian Spiral
Radius of Curvature (m)
Distance (m)
60
50
40
30
20
10
−10
0
10
20
30
40
50


Archimedean Spiral
Logarithmic Spiral
Eulerian Spiral
Radius of Curvature (m)
Distance (m)
50
45
40
35
30
25
20
15
−10
0
10
20
30
40


Achemedian Spiral
Logarithmic Spiral
Eularian Spiral
Radius of Curvature (m)
Distance (m)
50
45
40
35
30
25
20
15
−10
0
10
20
30
40