

In[1]:= (*Data generation for Fig3.12*)

In[2]:= Clear["Global`*"]
クリア

In[3]:= (*Load *)

In[4]:= P1 = 8 * EE * II * (2 * II / Ac) ^ (1 / 2) / l ^ 3 *
u ^ 3 * (3 / 2 - 1 / 2 * Tanh[u] ^ 2 - 3 / 2 * Tanh[u] / u) ^ (-1 / 2)
双曲線正接 双曲線正接

$$\text{Out[4]} = \frac{8 \sqrt{2} \text{EE II} \sqrt{\frac{\text{II}}{\text{Ac}}} u^3}{l^3 \sqrt{\frac{3}{2} - \frac{3 \text{Tanh}[u]}{2 u} - \frac{\text{Tanh}[u]^2}{2}}}$$

In[5]:= (* Deflection *)

In[6]:= delta1 = P1 * l ^ 3 / (4 * EE * II) * (u - Tanh[u]) / u ^ 3
双曲線正接

$$\text{Out[6]} = \frac{2 \sqrt{2} \sqrt{\frac{\text{II}}{\text{Ac}}} (u - \text{Tanh}[u])}{\sqrt{\frac{3}{2} - \frac{3 \text{Tanh}[u]}{2 u} - \frac{\text{Tanh}[u]^2}{2}}}$$

In[7]:= (*Axial Force*)

In[8]:= S1 = (Ac * EE * P1 ^ 2 / 2 * (3 / 2 - 1 / 2 * Tanh[u] ^ 2 - 3 / 2 * Tanh[u] / u) ^ (1 / 3))
双曲線正接 双曲線正接

$$\text{Out[8]} = 4 \left(\frac{\text{EE}^3 \text{II}^3 u^6}{l^6} \right)^{1/3}$$

In[9]:= (* Deflection on linear theory *)

In[10]:= deltalin = P1 * l ^ 3 / (12 * EE * II)

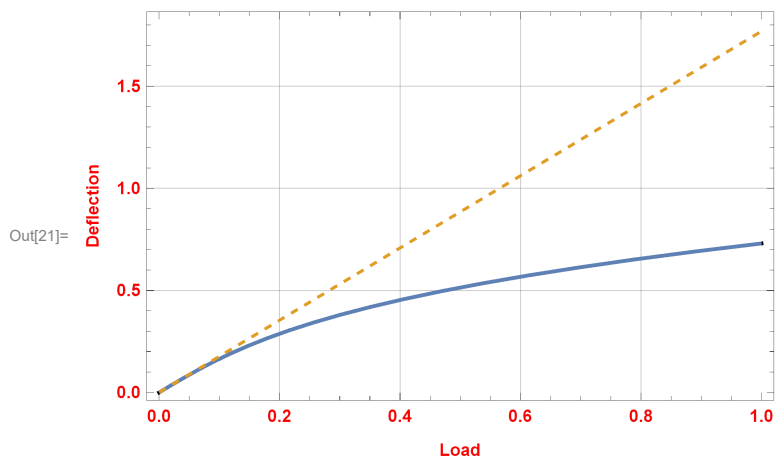
$$\text{Out[10]} = \frac{2 \sqrt{2} \sqrt{\frac{\text{II}}{\text{Ac}}} u^3}{3 \sqrt{\frac{3}{2} - \frac{3 \text{Tanh}[u]}{2 u} - \frac{\text{Tanh}[u]^2}{2}}}$$

In[11]:= (*Stress p.87 *)

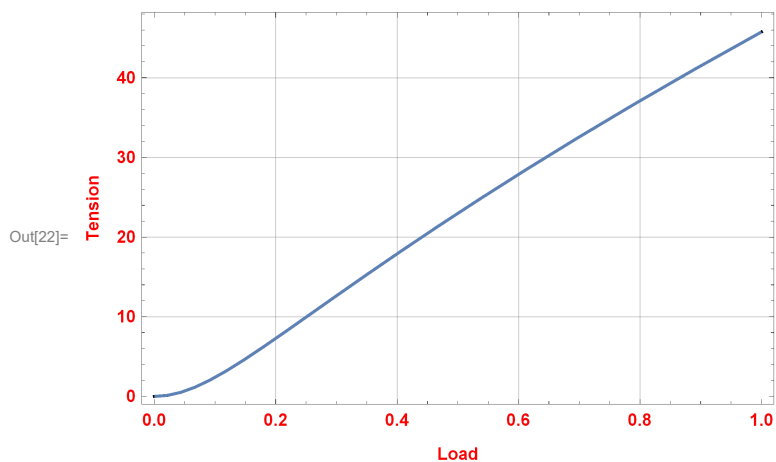
In[12]:= fmax = 1 / 3 * EE * h1 ^ 2 * u ^ 2 *
(1 + 6 ^ (1 / 2) * Tanh[u] * (3 / 2 - 1 / 2 * Tanh[u] ^ 2 - 3 / 2 * Tanh[u] / u) ^ (-1 / 2))
双曲線正接 双曲線正接 双曲線正接

$$\text{Out[12]} = \frac{1}{3} \text{EE h1}^2 u^2 \left(1 + \frac{\sqrt{6} \text{Tanh}[u]}{\sqrt{\frac{3}{2} - \frac{3 \text{Tanh}[u]}{2 u} - \frac{\text{Tanh}[u]^2}{2}}} \right)$$

Load	Def. (lin.)	Def. (non-lin.)	Axial F.
0.000213948	0.000378613	0.000378613	0.0000126579
0.0216986	0.0383989	0.0382429	0.129123
0.043708	0.0773479	0.076118	0.51139
0.0667617	0.118145	0.114015	1.14681
0.091379	0.161709	0.151943	2.0354
0.118079	0.208959	0.189914	3.17714
0.147381	0.260813	0.227936	4.57203
0.179803	0.318188	0.266019	6.22009
0.215862	0.382001	0.30417	8.1213
0.256077	0.453167	0.342398	10.2757
0.300963	0.5326	0.380709	12.6832
0.351037	0.621213	0.419109	15.3439
0.406813	0.719917	0.457603	18.2577
0.468804	0.82962	0.496195	21.4247
0.537524	0.951229	0.534889	24.8449
0.613482	1.08565	0.573687	28.5182
0.697188	1.23378	0.612591	32.4446
0.789151	1.39652	0.651602	36.6243
0.889877	1.57477	0.690719	41.0571
0.999869	1.76942	0.729943	45.743



```
In[22]:= ListLinePlot[lstpS, Frame -> True, GridLines -> Automatic,
  折れ線グラフ(点を繋いでブ… 枠 真 格子線 自動
  FrameLabel -> {"Load", "Tension"}, LabelStyle -> Directive[Red, Bold]]
  枠ラベル ラベルスタイル 指示子 赤 太字
```



```
In[27]:= lstpfmax = {}; lstpflin = {};
Print["Load Stress fmax(lin.) Stress fmax(non-lin.) "];
  出力表示
Do[
  反復指定
    lstpflin = Append[lstpflin, {N[P1], flin}];
      追加 数値
    lstpfmax = Append[lstpmax, {N[P1], fmax}];
      追加 数値
    Print[N[P1], " ", " ", flin, " ", " ", fmax], {u, 0.001, 2, 0.1}];
      出… 数値
ListLinePlot[{lstpfmax, lstpflin}, Frame -> True,
  枠 真
  GridLines -> Automatic, PlotStyle -> {Thick, Dashed},
  自動 プロットスタイル 太い 破線
  FrameLabel -> {"Load", "Stress"}, LabelStyle -> Directive[Red, Bold]]
  ラベルスタイル 指示子 赤 太字
```

Load	Stress fmax(lin.)	Stress fmax(non-lin.)
0.000213948	0.0261147	0.0265342
0.0216986	2.64855	2.72193
0.043708	5.33503	5.5079
0.0667617	8.14899	8.39572
0.091379	11.1538	11.3966
0.118079	14.4128	14.5215
0.147381	17.9894	17.7812
0.179803	21.9469	21.1863
0.215862	26.3483	24.7468
0.256077	31.257	28.4727
0.300963	36.7358	32.3732
0.351037	42.8479	36.4575
0.406813	49.6559	40.7339
0.468804	57.2227	45.2106
0.537524	65.6106	49.8952
0.613482	74.8821	54.7946
0.697188	85.0994	59.9156
0.789151	96.3245	65.2641
0.889877	108.619	70.8459
0.999869	122.045	76.666

