


# SwiftCalcs

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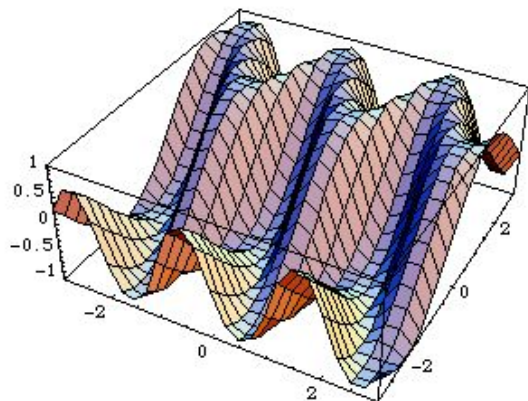
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```
In[4]:= Integrate[1/{x^3-1}, x]
```

$$\text{Out[4]} = \left\{ -\frac{\text{ArcTan}\left[\frac{1+2x}{\sqrt{3}}\right]}{\sqrt{3}} + \frac{1}{3} \text{Log}[-1+x] - \frac{1}{6} \text{Log}[1+x+x^2] \right\}$$

```
In[5]:= Plot3D[Sin[y+Sin[3 x]], {x, -3, 3}, {y, -3, 3}]
```



```
Out[5]= • SurfaceGraphics •
```

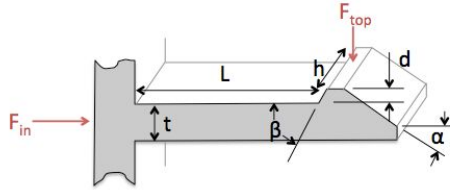


EDITOR	PUBLISH	VIEW
New Open Save Compare Print	Find Files Comment Indent	Insert Go To Find Breakpoints Run Run and Time Run and Advance
FILE	EDIT	NAVIGATE

```
untitled*
1 %% Code sections are highlighted.
2 % System command are supported...
3 !gzip sample.m
4 % ... as is line continuation.
5 A = [1, 2, 3,... % (mimicking the ouput is good)
6      4, 5, 6]
7 fid = fopen('testFile.text', 'w')
8 for i=1:10
9     fprintf(fid,'%6.2f \n', i);
10 end
11 x=1; %% this is just a comment, though
12 % Context-sensitive keywords get highlighted correctly...
13 p = properties(mydate); %(here, properties is a function)
14 x = linspace(0,1,101);
15 y = x(end:-1:1)
16 % ... even in nonsensical code.
17 end()(((end end)end )))end (function end
18 %{
19     block comments are supported
20 %} even
21 runaway block comments
22 are
```



To determine the appropriate thickness for this feature, we first start with inputs that define other aspects of the geometry and the material of choice:



We are seeking to solve for the beam thickness  $t$  based on the other known variables.

#### Inputs

- 1  $L \equiv$
- 2  $d \equiv$
- 3  $h \equiv$

For the angles of the entry plane, we have changed the unit to 'degrees' instead of radians:

- 4  $\alpha \equiv$

Our desired assembly force:

- 5  $F_{in} \equiv$

Friction:

- 6  $\mu \equiv$

Maximum Allowable Strain for Nylon:

- 7  $\epsilon_{max} \equiv$

Modulus for Nylon:

- 8  $E \equiv$

#### Calculation

Our first step is to convert the push force into the deflection force. This is done using simple geometry and friction calculations:

- 9  $F_{top} \equiv F_{in} \cdot \frac{1 - \mu \cdot \tan(\alpha)}{\mu + \tan(\alpha)}$

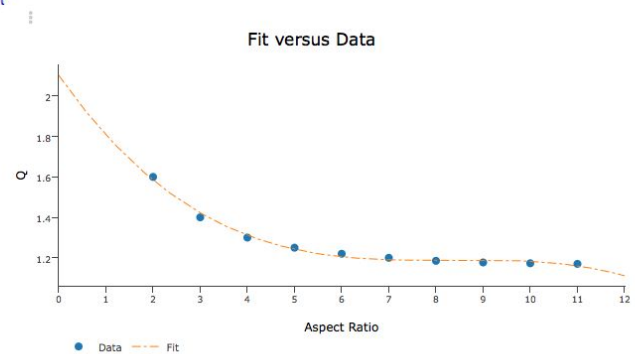
27.6 N

To calculate the strain, we need to know the deflection magnification factor  $Q$ . This factor is a function of the beam aspect ratio  $L/t$  and has a non-standard form. We will fit a curve to data from experiments to determine this factor as a function of the aspect ratio  $r$ . Note this data is for the case where the beam component is anchored in a mass of plastic much larger than itself, and it therefore is considered infinitely stiff:

```

10 > r ≡ [ 2 ... 11 ]
11 > Q ≡ [ 1.6 1.4 1.3 1.25 1.22 1.2 1.185 1.177 1.173 1.17 ]
12 > Q_fit(x) ≡ regression x_data ≡ r
    y_data ≡ Q
    polynomial order 3
    Polynomial Regression
    function(x) ⇒ -0.00161655012 · x3 + 0.04025 · x2 - 0.332784965 · x + 2.10198485
  
```

13 > plot



Next we write the equation for strain at the beam base based on the known deformation:

- 14  $e_1(t) \equiv 1.5 \cdot \frac{t \cdot d}{L^2 \cdot Q_{fit}\left(\frac{L}{t}\right)}$

Finally, we can also relate strain at the beam base to our desired force:

- 15  $e_2(t) \equiv F_{top} \cdot \frac{6 \cdot L}{h \cdot t^2 \cdot E}$



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