Walk-in Slide: AU 2014 Social Media Feed

1. Click on the link below, this will open your web browser

http://aucache.autodesk.com/social/visualization.html

2. Use “Extended Display” to project the website on screen if you plan to work on your computer. Use “Duplicate” to display same image on screen and computer.

JDM

Finite Element Analysis for the Casual User in Inventor

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Class summary

This is an introductory class into the advanced topic of finite element analysis (FEA). This class will be application-oriented rather than theory oriented, and it is intended for those of us who can gain design value from some basic FEA techniques without having to have a PhD in mathematics. The goal is to bring the accessibility of advanced Digital Prototyping tools to the casual user.

Key learning objectives

At the end of this class, you will be able to:

- Learning objective 1 – Consider the meaning of life: How do you know you have the answer?
- Learning objective 2 – Learn how to identify the scope and limitations of FEA in Inventor software.
- Learning objective 3 – Setting up FEA of simple assemblies in Autodesk Inventor.
- Learning objective 4 – Learn how to do a parametric dimension FEA test of part iterations in Inventor software.

Learning objective 1 – Consider the meaning of life: How do you know you have the answer?

The meaning of life is -

42

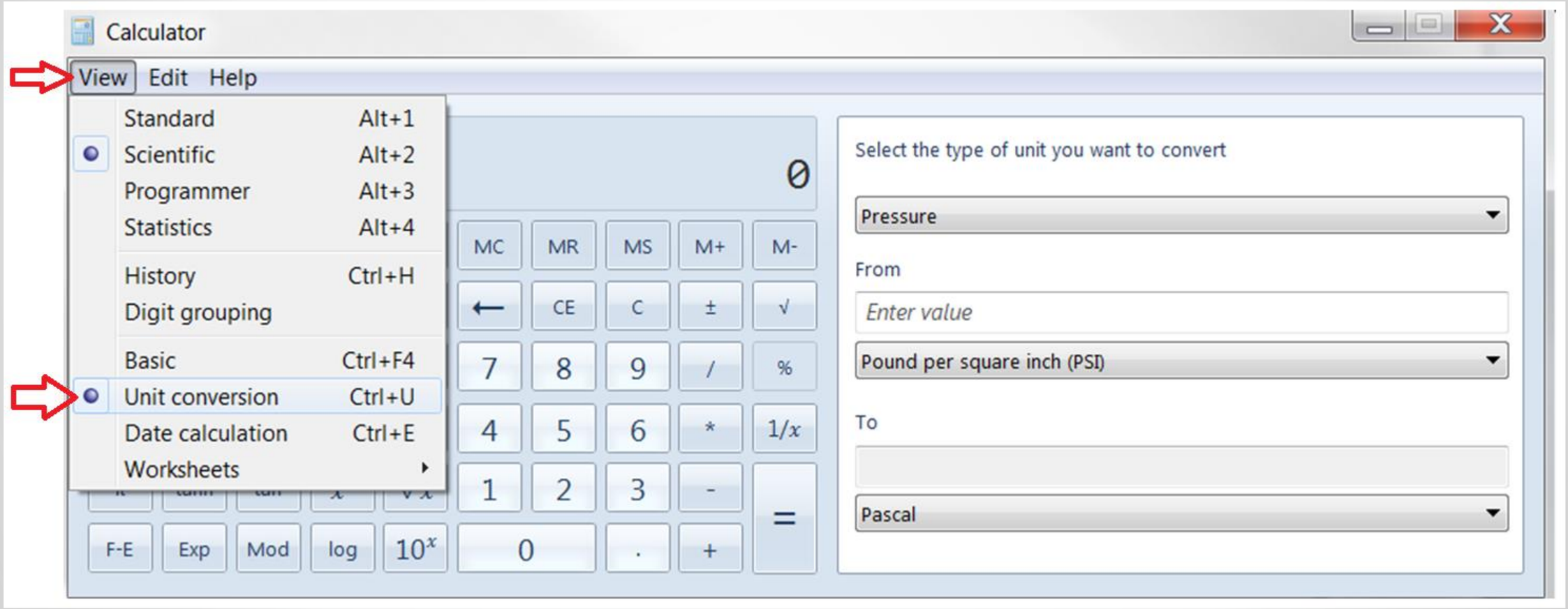
The Hitchhikers Guide to the Galaxy – Douglas Adams

Huh, you say?

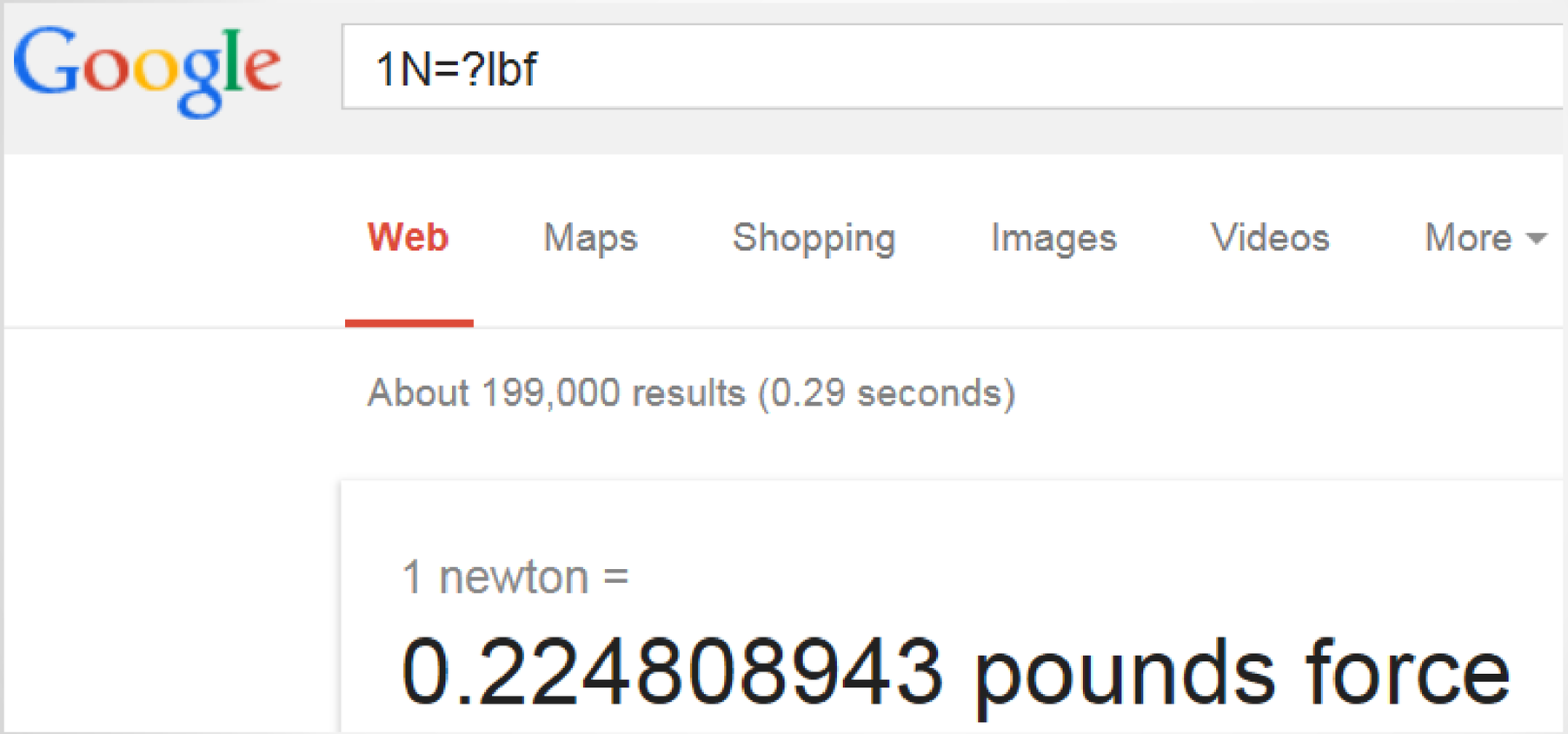
What is the problem with that answer? Anyone?

Oops, I forgot the units!

Windows Calculator

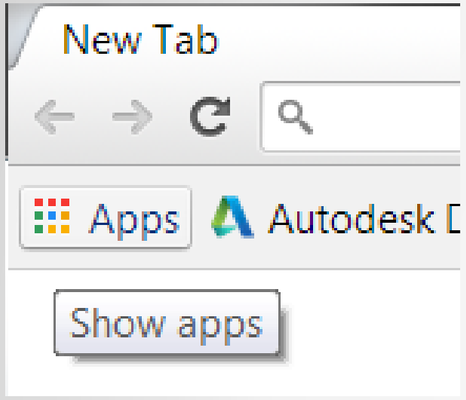


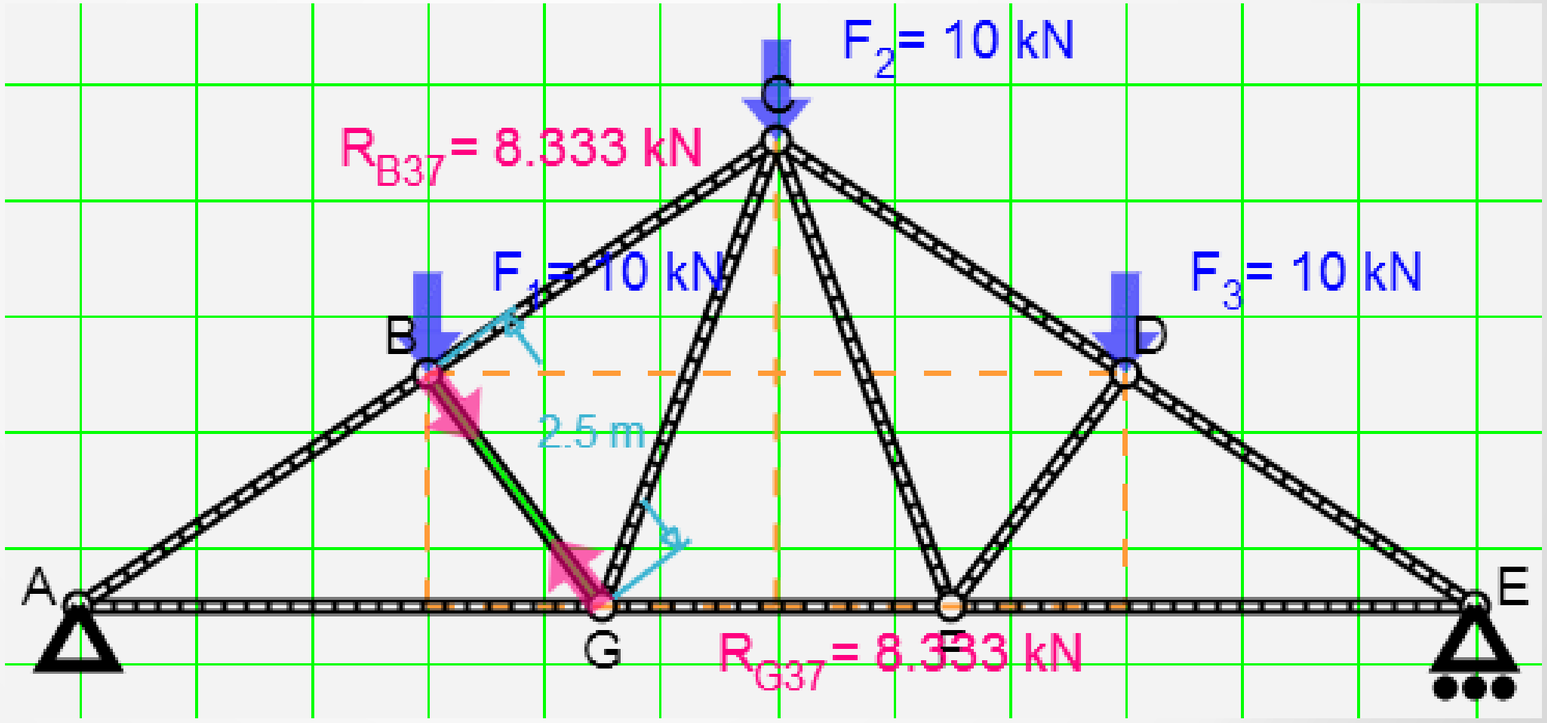
Google Conversion



*About 1 small apple.

Autodesk ForceEffect





Demonstration – difference between force and pressure – volunteer* from the audience.

Pressure = Force/Area

***(Someone who hasn't done their homework – that is, read the handout for this class.)**

How do we know when we have a number that makes sense and is useful?

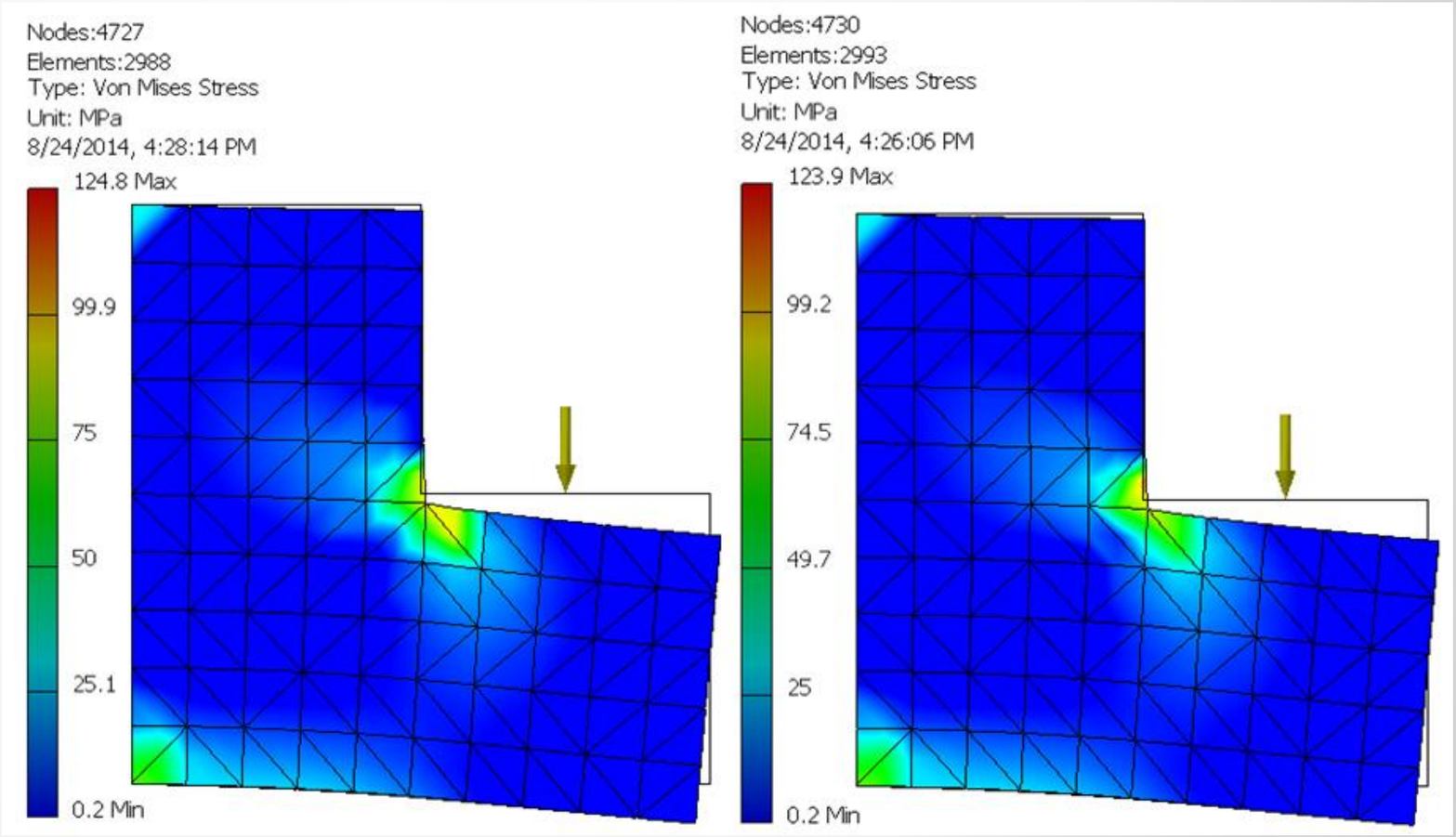
Why do we use FEA?

- Predictive
- Validation
- Weight Reduction
- Material Optimization
- Marketing?

When doing FEA – what is the most important result parameter?

- Calculated Stress?
- Displacement?
- Safety Factor?

Demonstration – Why do we get different results with the “same” input conditions?



Screencast Recording

Using the Percentage Difference Formula there is a 0.72% difference, in other words – the results are identical.

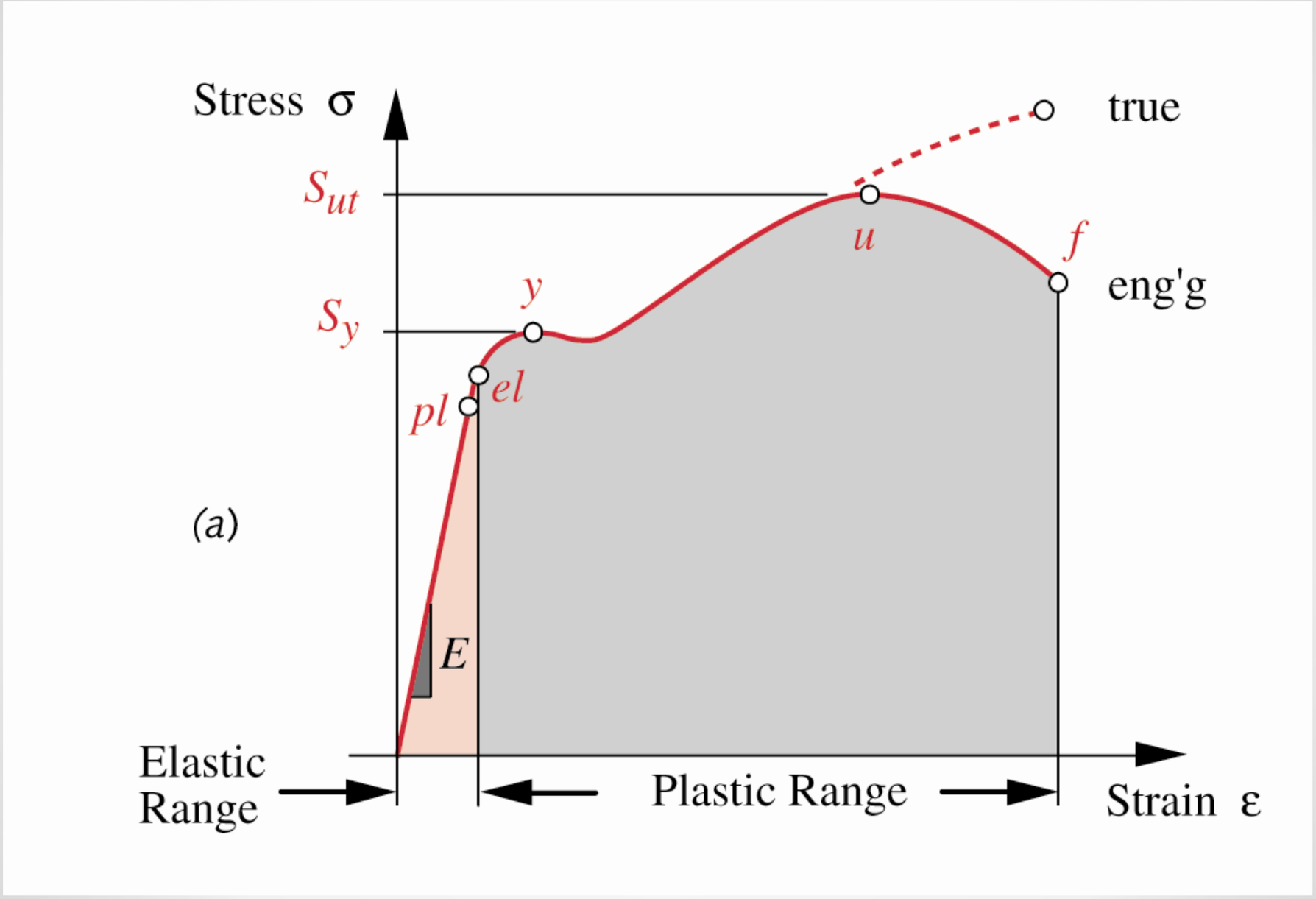
(|123.9-124.8|)/((123.9+124.8)/2))*100)=0.72%

http://www.mathsisfun.com/percentage-difference.html
http://www.calculatorsoup.com/calculators/algebra/percent-difference-calculator.php

Learning objective 2 – Learn how to identify the scope and limitations of FEA in Inventor software.

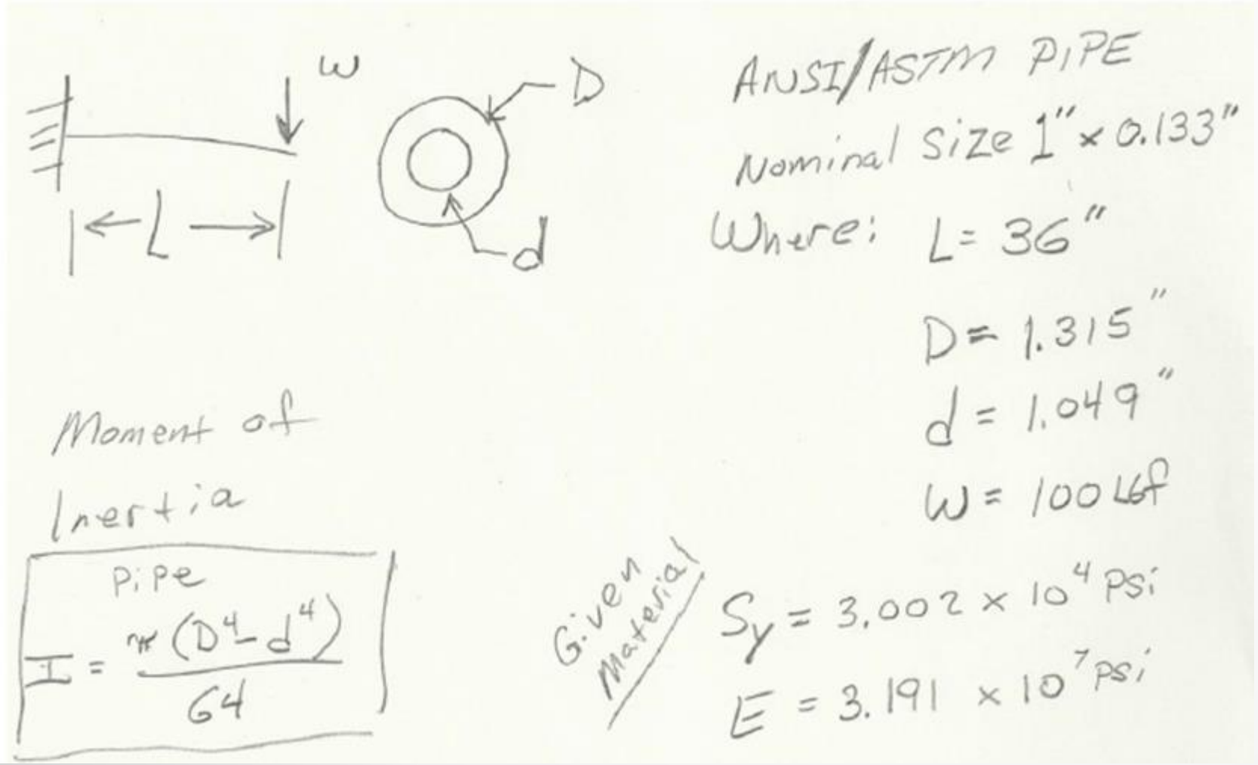
FEA in Inventor is limited to:

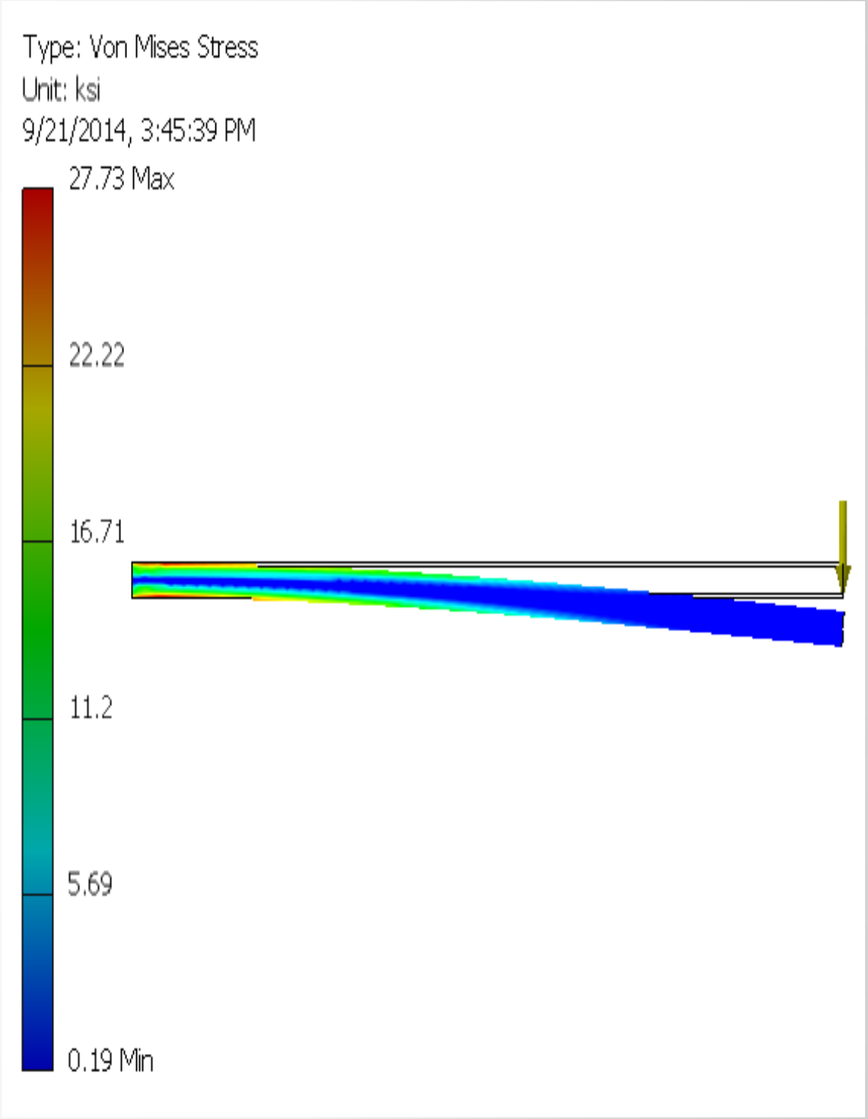
- Linear static stress within the elastic range.
- Isotropic materials.
- Relatively rigid materials (not highly elastic or brittle*).
- Relatively small displacements.
- Slowly applied loads (not impact loads).


Stress σ
true
S_{ut}
u
f
eng'g
y
S_y
el
pl
(a)
E
Elastic
Range
Plastic Range
Strain ε

Theory based calculations.

Appendix: Example Hand Calculations





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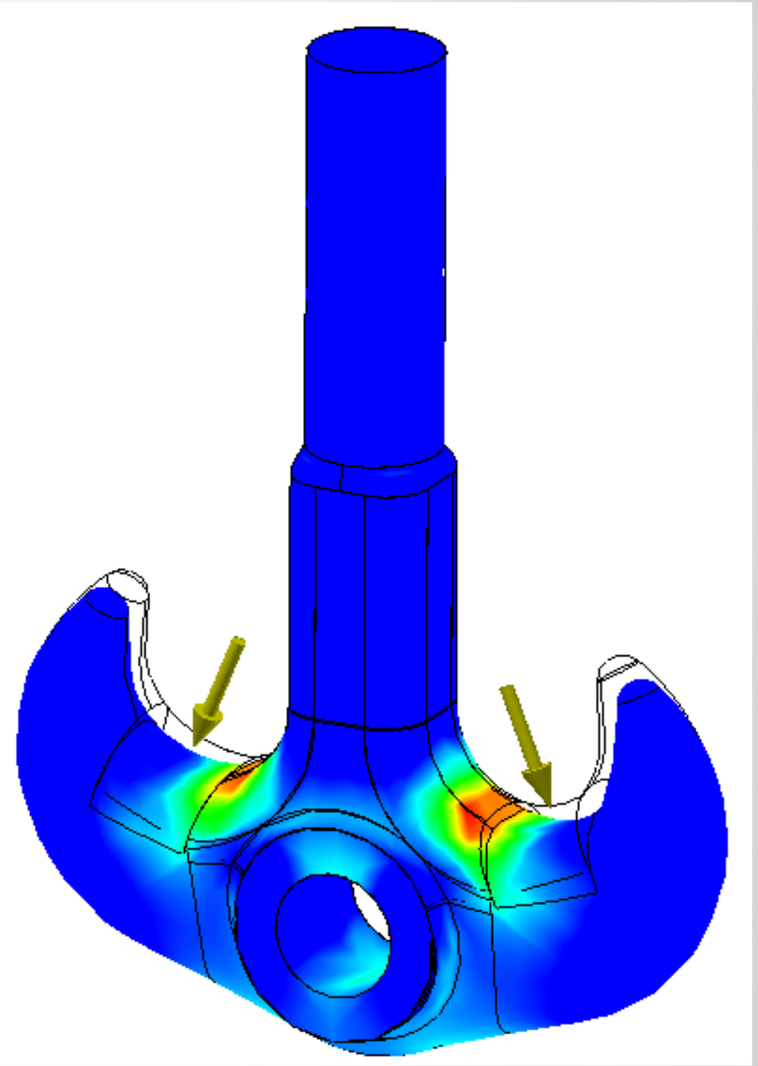
Complex Geometry Analysis



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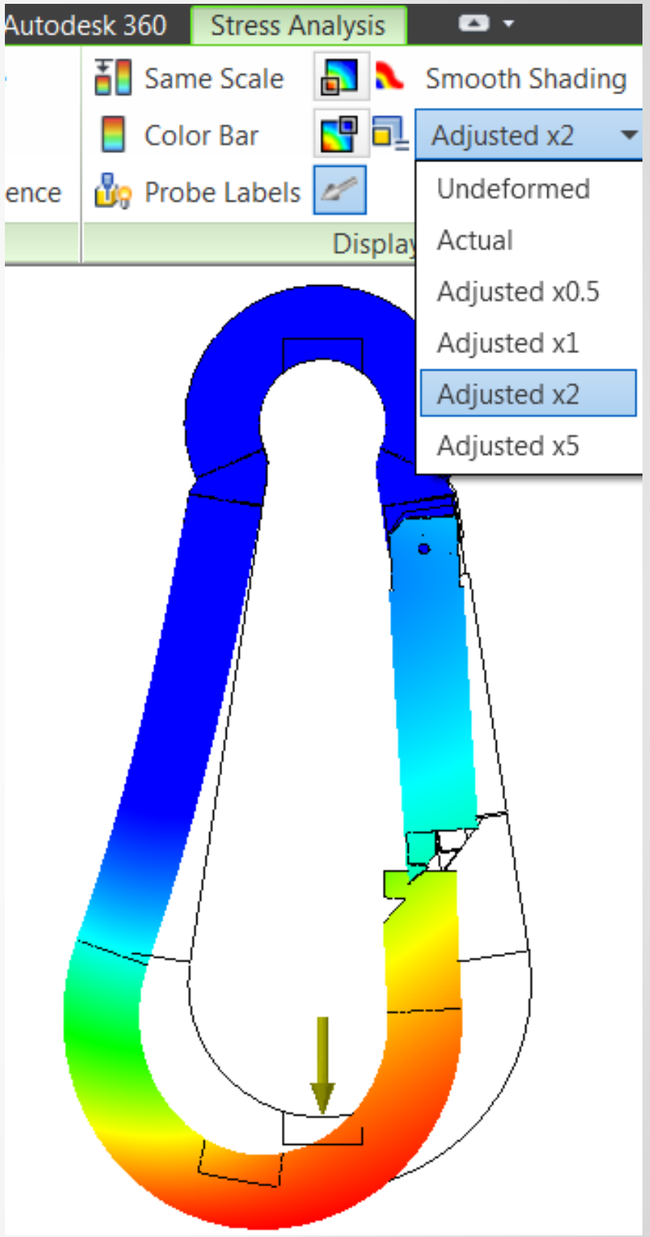
Presentation of Analysis



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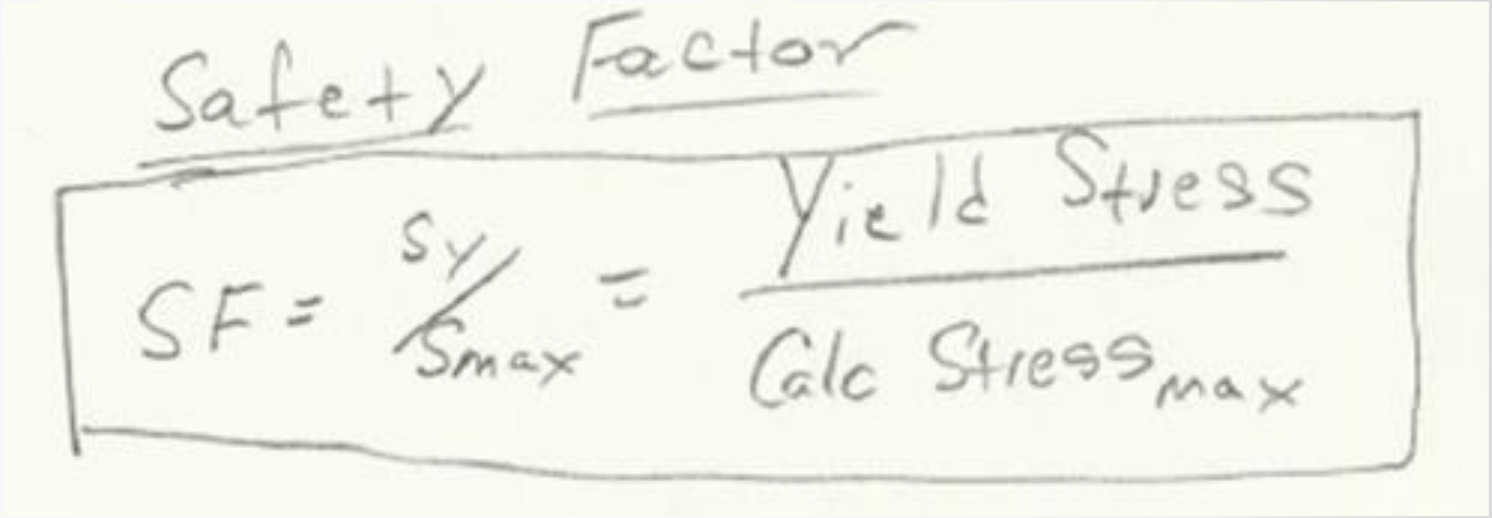
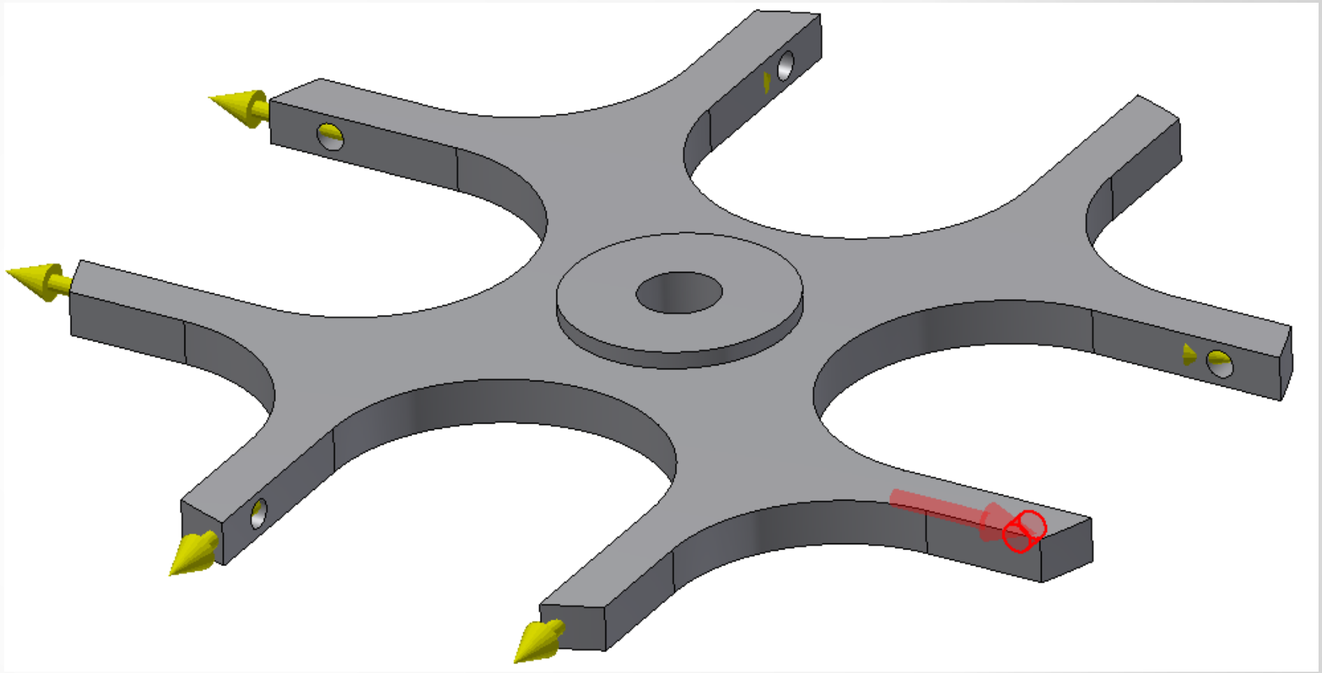
Safety Factor



Location of Glyphs



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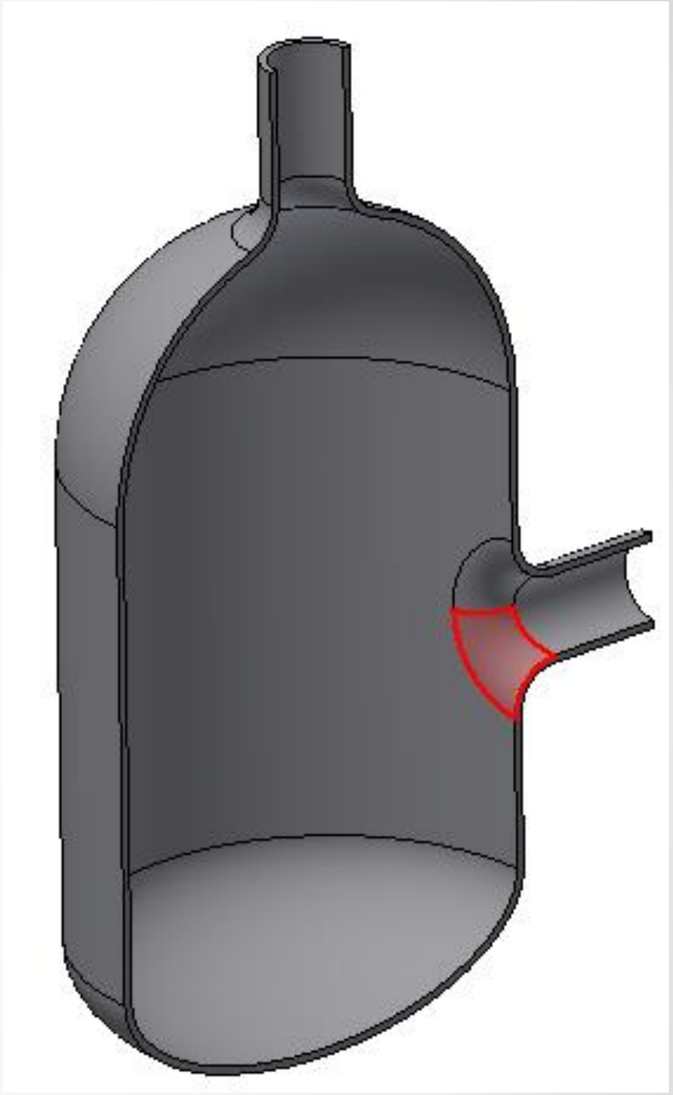
Tip on placing pressure



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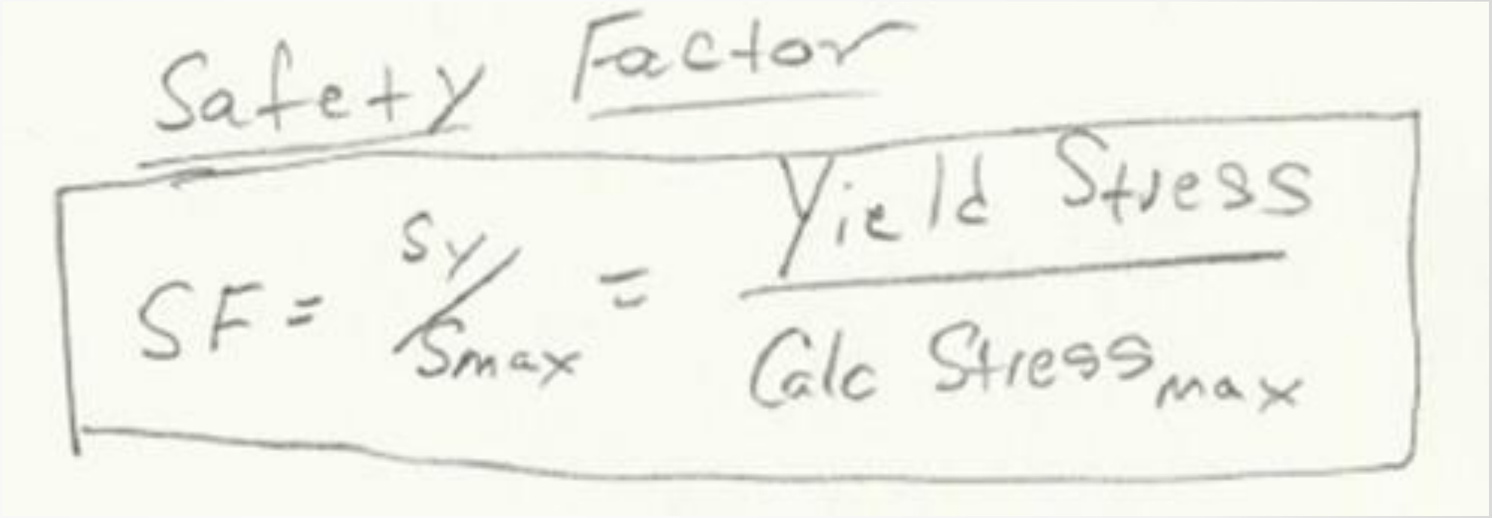
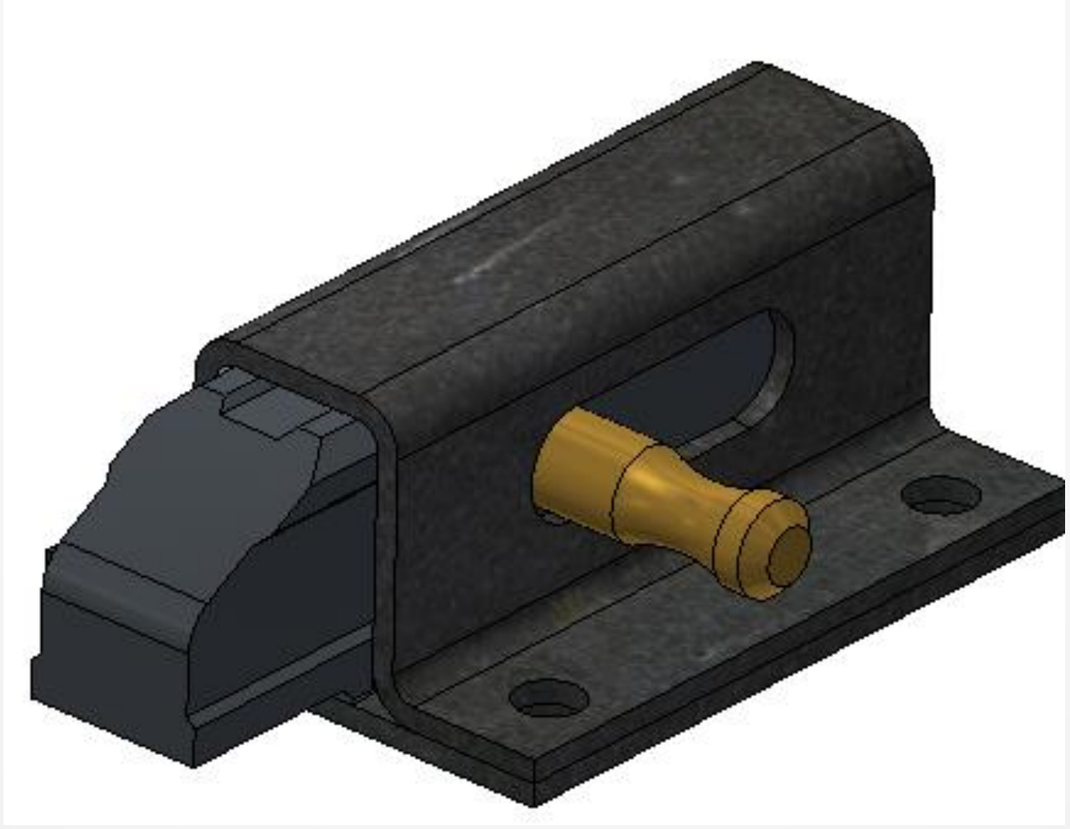
Safety Factor



Learning objective 3 – Setting up FEA of simple assemblies in Autodesk Inventor.



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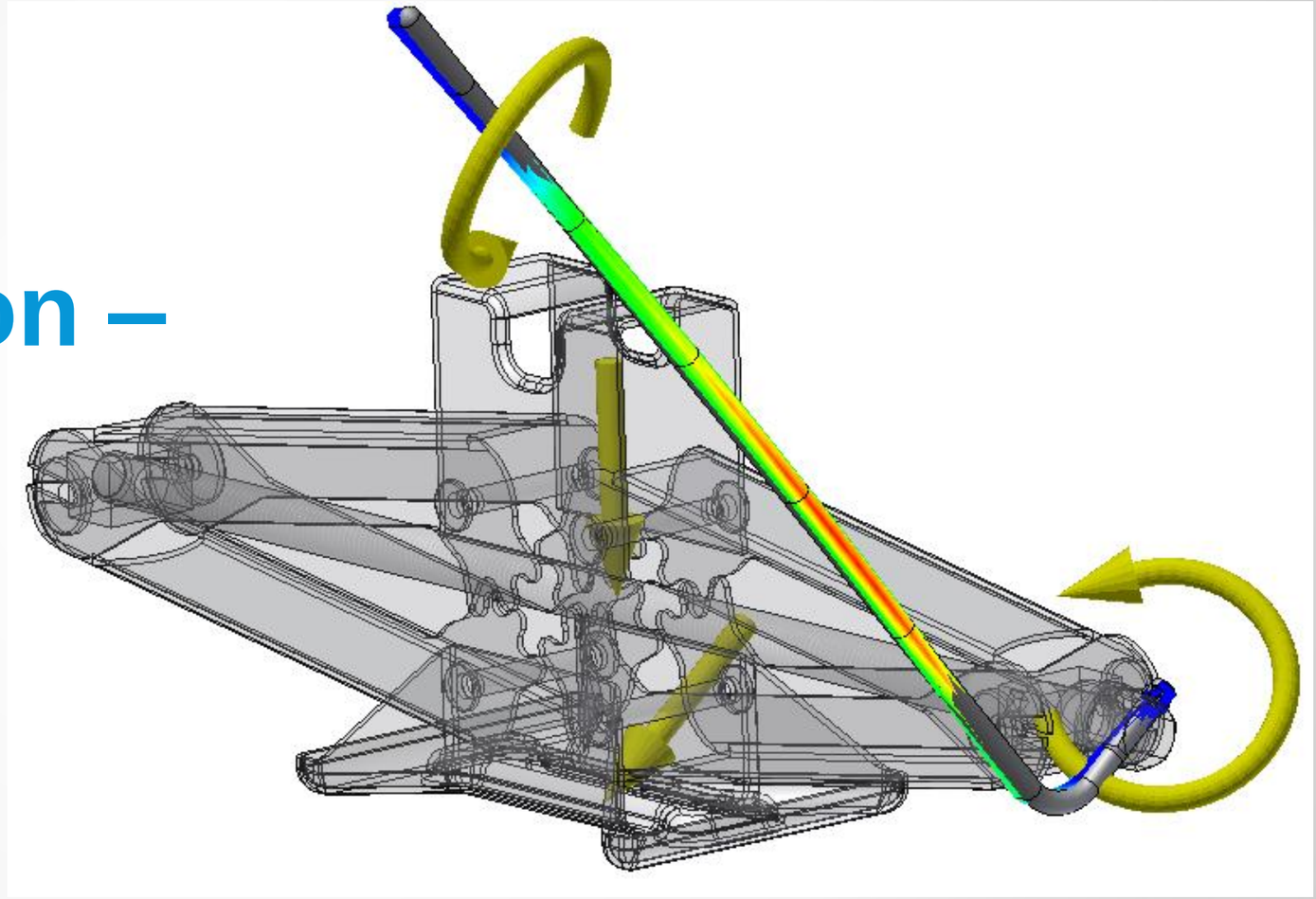
Dynamic Simulation – Motion Loads



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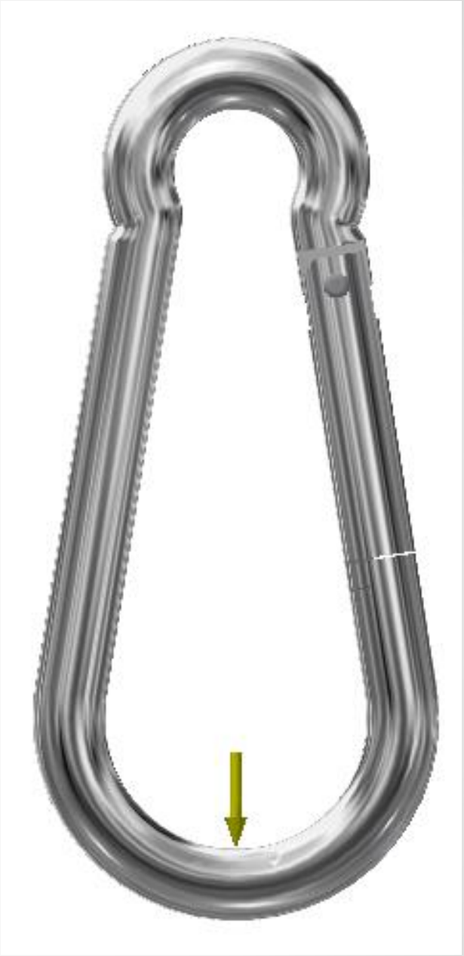
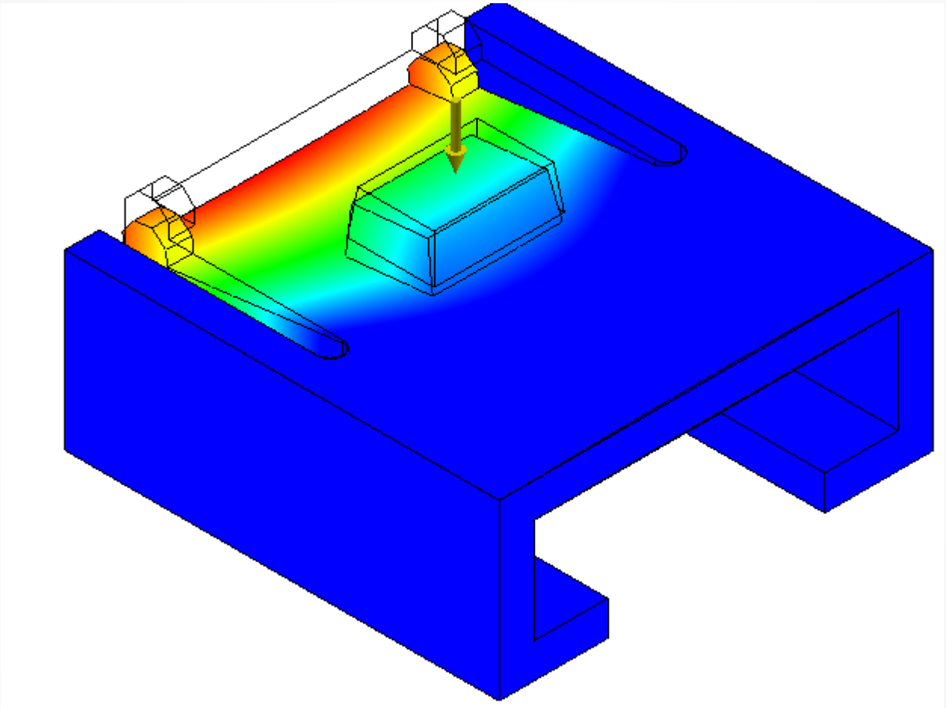
Consider -
Classical Hand Calculation



Learning objective 4 – Learn how to do a parametric dimension FEA test of part iterations in Inventor software.



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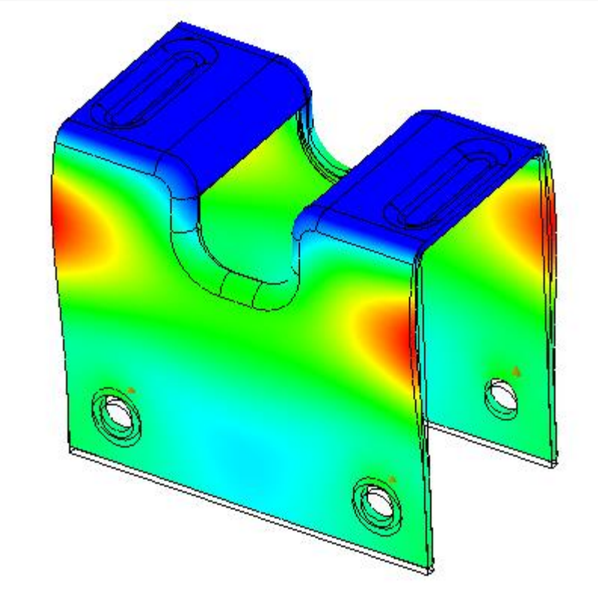
Final Thoughts…



… do we know what we think we know?

Screencast Recording

Review –

- Compare the calculated results to experiential results.
- Take care with units – ex., pressure and force are different.
- Limit digital model predictions to similar problems.
- Safety Factor does not indicate fracture.

42

The Hitchhikers Guide to the Galaxy – Douglas Adams

Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2014 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time

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