

# 4040-849 OPTIMIZATION METHODS

## WRITTEN ASSIGNMENT 2

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### PROBLEM 1-a.

#### Solution.

Making the substitution of  $f(\lambda)$  for  $\frac{\tau_{zy}}{p_{max}}$ , where  $\lambda = \frac{z}{b}$ , we get a simplified equation that can be simplified as follows.

$$\begin{aligned} f(\lambda) &= -\frac{1}{2} \left[ -\frac{1}{\sqrt{1+\lambda^2}} + \left( 2 - \frac{1}{1+\lambda^2} \right) \sqrt{1+\lambda^2} - 2\lambda \right] \\ &= \text{DISTRIBUTE}(-1/2) \text{throughout} \end{aligned}$$

TODO: introduce variable replacements, and then start simplification below

$$\begin{aligned} f(\lambda) &= lol \\ &= \frac{0.5}{\sqrt{1+\lambda^2}} - \sqrt{1+\lambda^2} \left( 1 - \frac{0.5}{1+\lambda^2} \right) + \lambda \end{aligned}$$

### PROBLEM 1-b.

#### Solution.

$$f'(x) = -f(x) = -\frac{0.5}{\sqrt{1+x^2}} + \sqrt{1+x^2} \left( 1 - \frac{0.5}{1+x^2} \right) - x$$

J	$A_1$	$B_1$	$L_1$	$L_2^*$
4	5	6	1	1
7	8	9	1	1

### PROBLEM 1-c.

#### Solution.

$$f(x) = \frac{0.5}{\sqrt{1+x^2}} - \sqrt{1+x^2} \left( 1 - \frac{0.5}{1+x^2} \right) + x$$

$$f'(x) = \frac{x(-x^2 - 2.)}{(x^2 + 1)^{3/2}} + 1$$

$$f''(x) = \frac{x^2 - 2.}{\sqrt{x^2 + 1} (x^2 + 1.)^2}$$

**PROBLEM 1-d.**

**Solution.**