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Project 2: Problem 1

Part A: Safe Values of Parameters a,b

```
L = 2.5 %m
```

```
L = 2.5000
```

```
a = 220;
b = 220;
ab_all = zeros(a+1,b+1);
for i = 0:a
    for j = 0:b
        w = @(x,i,j) i+j*sqrt(sinh(x.^2));
        xw = @(x,i,j) x.*(i+j*sqrt(sinh(x.^2)));
        F = integral(@(x) w(x,i,j),0,L);
        d = integral(@(x) xw(x,i,j),0,L)/F;
        if (F*d/L) < 125 && F-(F*d/L)<95

            A = [1 1
                 0 1];

            B = [F;F*d/L];

            R = A\B;
            ab_all(i+1,j+1) = sum(R);
            ab(i+1,j+1) = sum(R);

        else
             A = [1 1
                 0 1];

            B = [F;F*d/L];
            R = A\B;
            ab_all(i+1,j+1) = sum(R);
        end
    end
end
```

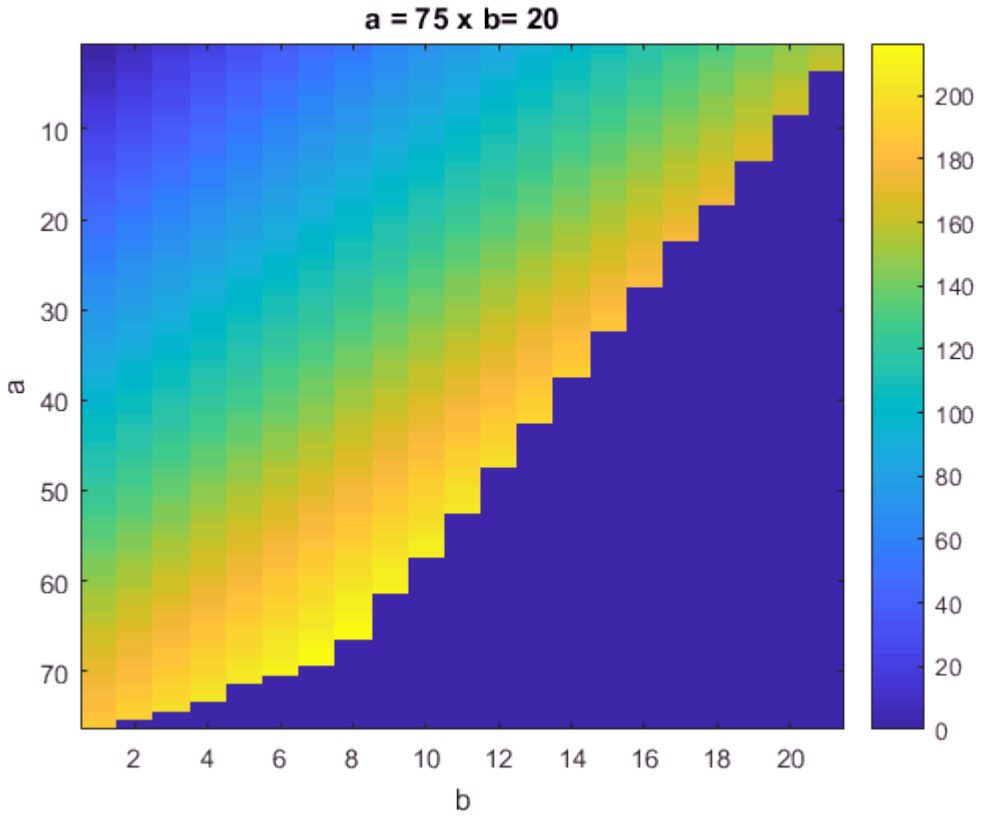
A for loop was created that tested the possible values for a & b, based on inspection the highest possible value for either paremeter would be 220 as the max of R_A & max of R_B is 95N and 125N, respectively. Thus, the sum of R_A & R_B cannot surpass 220. Solely from looking at the weight function, this can only happen when a = 220 and b = 0.

From writing code that created 2 matrices -- one with non-allowable values & one without non-allowable values -- it can be seen that a needs to $0 \leq a \leq 75$ & $0 \leq b \leq 20$.

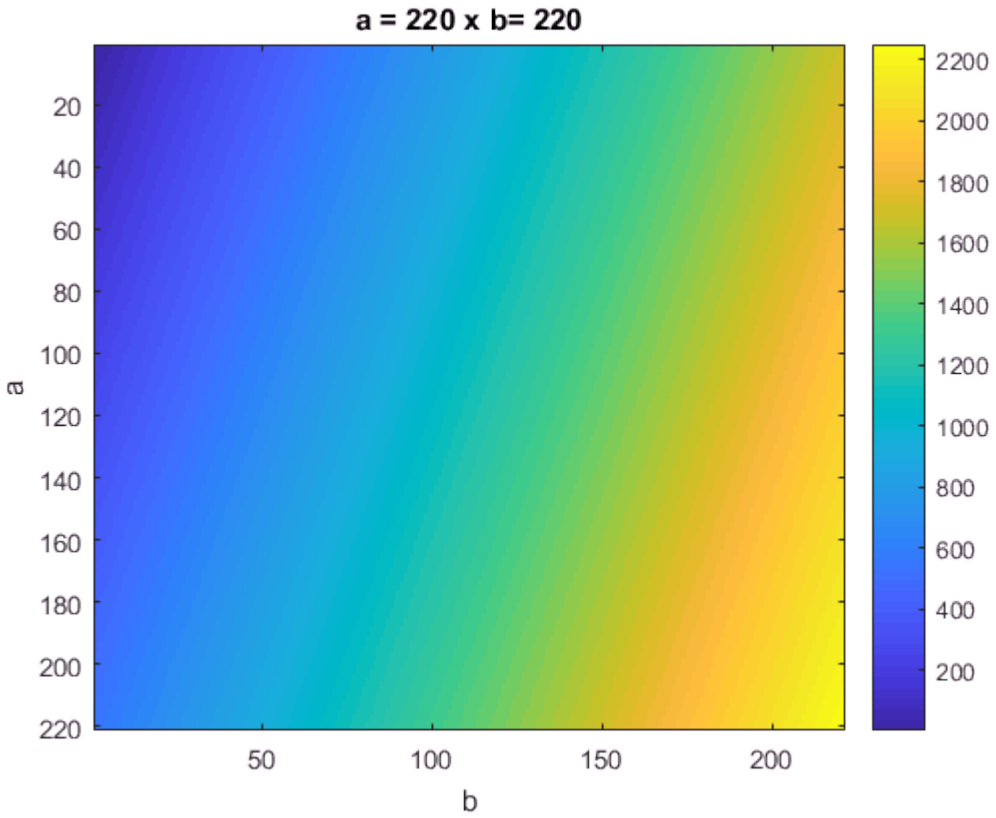
Part B: Visual Representation of Allowable Parameters

```
imagesc(ab)
ylabel('a')
xlabel('b')
```

```
title('a = 75 x b= 20')
colorbar
```




```
imagesc(ab_all)
ylabel('a')
xlabel('b')
title('a = 220 x b= 220')
colorbar
```



The purple in the 1st colormap are non-acceptable values from which one can ascertain the acceptable range of parameters a and b. Then, in the 2nd color map, one can see the higher values that result from the restricted values.