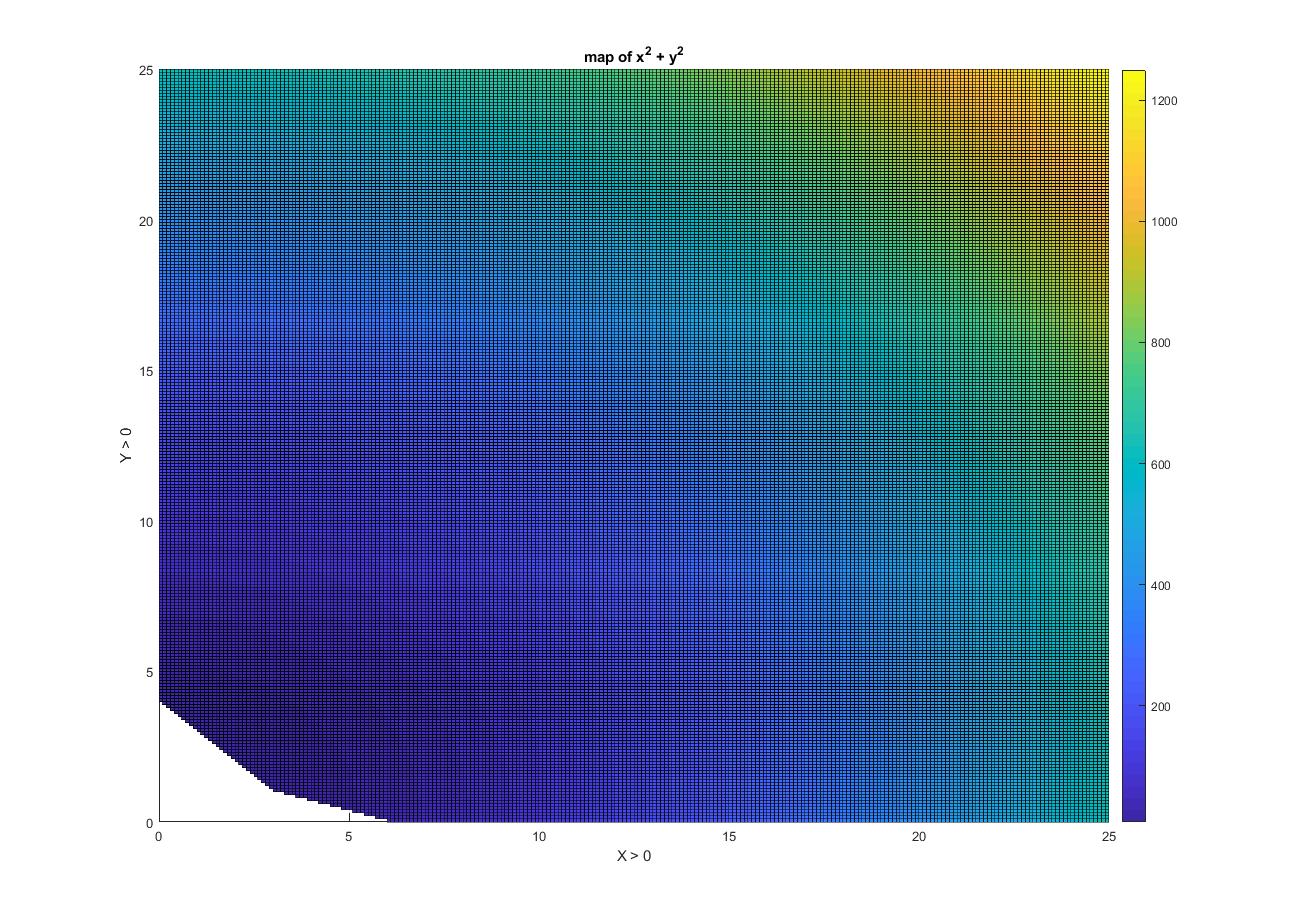
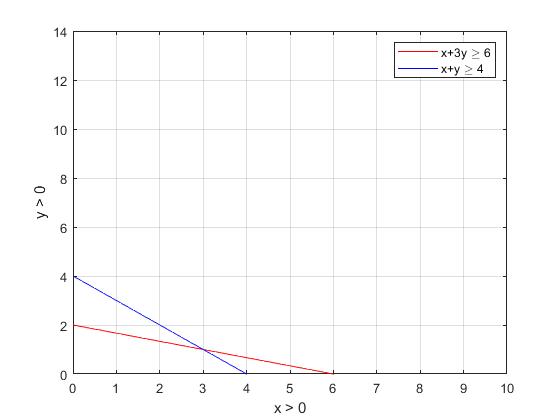
ABHISHEK KASHYAP (Week 1)

**Question 1:**

Shown below are the inequalities, with the region of interest for both plots more clearly illustrated in the lower figure with a colormap. MATLAB was used to plot the figures. The colormap can be interpreted as a heat map created using the objective function .

MATLAB codes:

v = -10:0.1:25;

[X,Y] = meshgrid(v);

conditions = (X + 3\*Y >= 6) & (X + Y >= 4) ...

& (X >= 0) & (Y >= 0); % contains logical 0's and 1's

conditions = double(conditions);

conditions(conditions == 0) = NaN;

X = X .\* conditions;

Y = Y .\* conditions;

objective\_function = X.^2 + Y.^2;

[app.min\_val, Idx] = min(objective\_function(:));

[app.min\_row, app.min\_col] = ind2sub(size(objective\_function), Idx);

app.min\_val\_x = X(app.min\_row, app.min\_col);

app.min\_val\_y = Y(app.min\_row, app.min\_col);

figure, surf(X, Y, objective\_function), colorbar, view(0,90)

xlabel('X > 0'), ylabel('Y > 0'), zlabel('X^2 + Y^2'), title('map of x^2 + y^2')

The values that satisfy the optimization are

**Question 2:**

Using basic calculus, let

Taking its derivative and equating it to zero:

For determining maxima, double derivate should be negative:

Plugging in and for in , the optimal objective value is and the optimal solution is .

**Question 3:**

Closing stock prices were downloaded from Yahoo finance for the last 24 months 2016-18. Using the code provided in the lesson, the following results were obtained:

|  |  |
| --- | --- |
| **Data from lesson**  ----------------------  MSFT: Exp ret = 0.024611, Risk = 0.058040  V: Exp ret = 0.018237, Risk = 0.042807  WMT: Exp ret = 0.009066, Risk = 0.044461  ----------------------  Optimal portfolio  ----------------------  x[MSFT] = 0.582818  x[V] = 0.204324  x[WMT] = 0.212858  ----------------------  Exp ret = 0.020000  risk = 0.038256  ---------------------- | **New data 2016-18**  ----------------------  MSFT: Exp ret = 0.029252, Risk = 0.036801  V: Exp ret = 0.025350, Risk = 0.034881  WMT: Exp ret = 0.014360, Risk = 0.061106  ----------------------  Optimal portfolio  ----------------------  x[MSFT] = 0.430991  x[V] = 0.552723  x[WMT] = 0.016286  ----------------------  Exp ret = 0.026853  risk = 0.031653  ---------------------- |

Based on new data and the optimal investment derived from it, the maximum amount invested should be in Visa stocks = $552.7

Expected monthly return is $26.85 with a standard deviation of $31.65. Based on the range, end of the month wealth will most likely be in the range $930-$1122.