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% Code for the contour plots in the (q,n) plane for fixed values of r and f.

% Define an array of r and f values and loop through them.
figure;
r_array = [1, 5];
f_array = [1, 1];
plotcolors = 'rb';
n = linspace(0.001,15,1000);
for k = 1:length(r_array)
    r = r_array(k);
    f = f_array(k);
    q = (f.*(1+n+n.*r-r)+r-n-1) ./ (f.*(1+n+n.*r-r)-n.*r); % Eq. (6)
    index = find(q>0); % To avoid plotting the singularity
    hold on;
    h = plot(q(index), n(index), '-');
    set(h, 'Color', plotcolors(k));
    clear r f q index h;
end
clear r_array f_array plotcolors n;

% Plot one additional point.
q = 5; n = 10;
h = plot(q, n, 'o');
set(h, 'MarkerEdgeColor', 'b', 'MarkerFaceColor', 'b', 'MarkerSize', 8);

% Find the corresponding R-value.
f = 13/14;
R = (1+n)*(1+q*f-f) / (f*(q-1)*(1-n)+q*n+1); % Eq. (1)
disp(sprintf('Parameters n=%d, q=%d, f=%d: R=%d', n, q, f, R));

% Adjust the plot.
xlabel('q=q_i/q_o', 'fontsize', 14);
ylabel('n=N_o/N_i', 'fontsize', 14);
set(gca, 'XLim', [0, 15]);
set(gca, 'YLim', [0, 15]);
set(gca, 'FontSize', 14);

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