(1)

A = [1 2; 0 2];

[U, S, V] = svd(A);

v1 = V(:, 1); v2 = V(:, 2);

u1 = U(:, 1); u2 = U(:, 2);

simga\_u1 = S(1, 1) \* u1;

sigma\_u2 = S(2, 2) \* u2;

t = 0:0.01:(2 \* pi);

x1 = cos(t); y1 = sin(t);

w = A \* [x1; y1];

x2 = w(1, :); y2 = w(2, :);

figure(1);

plot(x1, y1, 'k');

hold on;

line\_plot(v1, 'b');

hold on;

line\_plot(v2, 'r');

grid on;

title('On pre-image unit circle');

figure(2);

plot(x2, y2, 'k');

hold on;

line\_plot(simga\_u1, 'b');

hold on;

line\_plot(sigma\_u2, 'r');

grid on;

title('On image ellipse');

function line\_plot(v, color)

t = 0:0.01:1;

x = v(1) \* t; y = v(2) \* t;

plot(x, y, color);;

end

The plot is as follows:

