%% 个人信息

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% x=3,y=7

% m=x+y=10

%% 计算复数根

%初始化z

z=3+7i;

%开10次方根

n=10;

% 计算模和幅角

r=abs(z);

theta=angle(z);

% 带入k=1-10,计算n重根

roots=zeros(1,n);

for k=0:n-1

roots(k+1)=nthroot(r,n)\* exp(1i\*(theta + 2\*pi\*k)/n);

end

% 提取实部和虚部

real\_parts = real(roots);

imag\_parts = imag(roots);

%% 绘制复数根

%图例

figure;

plot(real\_parts, imag\_parts, 'ro', 'MarkerSize', 2, 'DisplayName', 'n次方根');

hold on;

for k = 1:n

label = ['$w\_{' num2str(k) '}$'];

text(real\_parts(k) + 0.07, imag\_parts(k), label, 'Interpreter', 'latex', 'FontSize', 12, 'Color', 'black');

end

%标上箭头

for k = 1:n

plot([0 real\_parts(k)], [0 imag\_parts(k)],'color',[0.5451,0.27059,0.07451],'LineWidth', 0.75);

quiver(0, 0, real\_parts(k), imag\_parts(k), 0,'color',[0.5451,0.27059,0.07451], 'LineWidth', 0.75, 'MaxHeadSize', 0.2);

end

%% 图形美化

% 绘制圆

theta\_circle = linspace(0,2\*pi,100);

circle\_x=nthroot(r,n)\*cos(theta\_circle);

circle\_y=nthroot(r,n)\*sin(theta\_circle);

plot(circle\_x, circle\_y,'color',[0.4660 0.6740 0.1880], 'linewidth', 1);

% 连成多边形

plot([real\_parts real\_parts(1)], [imag\_parts imag\_parts(1)], 'color',[0.27451,0.5098,0.70588], 'LineWidth', 1);

%% 坐标轴初始化

%绘制坐标轴

axis\_length = 1.2 \* nthroot(r, n);

quiver(0, 0, axis\_length, 0, 0, 'k', 'LineWidth', 1, 'MaxHeadSize', 0.2);

quiver(0, 0, 0, axis\_length, 0, 'k', 'LineWidth', 1, 'MaxHeadSize', 0.2);

plot([-axis\_length, 0], [0, 0], 'k', 'LineWidth', 1);

plot([0, 0], [-axis\_length, 0], 'k', 'LineWidth', 1);

text(axis\_length, 0.05, '$x$', 'Interpreter', 'latex', 'FontSize', 10);

text(0.05, axis\_length-0.1, '$y$', 'Interpreter', 'latex', 'FontSize', 10);

text(0.1, 0.1, '$O$', 'Interpreter', 'latex', 'FontSize', 10, 'HorizontalAlignment', 'center', 'VerticalAlignment', 'middle');

% 设置图形属性

axis equal;

title('$w =\sqrt[10]{3+7i}$','interpreter','latex');

grid on;

hold off;

%% 计算相对误差

% 计算多边形的周长

C1 = 0;

for k = 1:n-1

% 计算相邻点之间的距离

C1 = C1 + abs(roots(k+1) - roots(k));

end

C1 = C1 + abs(roots(1) - roots(n));

% 计算圆的周长

C2 = 2 \* pi \* nthroot(r, n);

% 计算相对误差

error = abs(C1 - C2) / C1;

%标出相对误差

text(0.6, 1.4, '相对误差 ', 'FontSize', 12, 'HorizontalAlignment', 'center');

text(1.2, 1.38, '$$\sigma = 1.64\%$$', 'Interpreter', 'latex', 'FontSize', 12, 'HorizontalAlignment', 'center');