Matt McDade
System Simulation
Midterm Problem 4

A) corrector is 4^{th} order accurate since it satisfies 4 of lamberts equations

$$H_c(z) = \frac{T\left(\frac{70}{151}z^2 + \frac{44}{151}z - \frac{48}{151}\right)}{\left(z^2 - \frac{236}{151}z + \frac{85}{151}\right)}$$

B) $pLTE_c = \frac{C_c}{C_p - C_c} \cdot T$

as found in 2B, $C_p = \frac{5}{11}$ and $C_c = \frac{49}{302}$

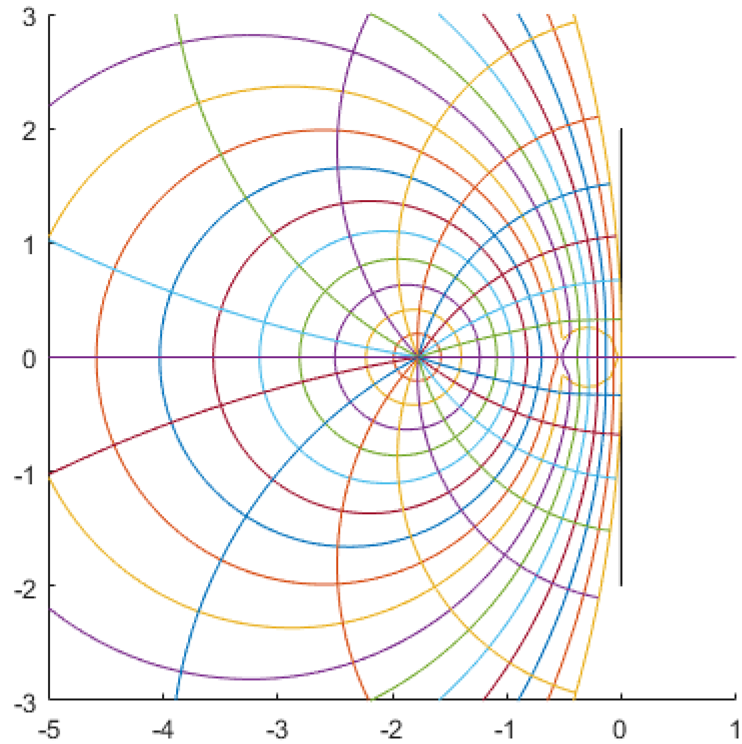
$$pLTE_c = \frac{\frac{49}{302}}{\frac{5}{11} - \frac{49}{302}} \cdot T = \boxed{\frac{539}{971}} T = \boxed{0.5551 \cdot T}$$

C) see attached matlab

D) stable + accurate: $T = \frac{1}{4}$ (so $\lambda T = -1$)

E) both stability regions have that bulge-looking thing on the right side of their centers, with the predictor's reaching into the positive. This is the inaccurate area of both. The stable + accurate regions are also similar for both, which I think is a good thing!

```
% Matt McDade
% System Simulation
% Midterm Exam Problem 4C

Nt=20;
Nr=17;

theta=linspace(0,2*pi,1001);
rho=linspace(0,1,1001);

tvec=linspace(0,2*pi,Nt);
rvec=linspace(0,1,Nr);

figure(1)
clf
hold on
    plot(rho*0,4*rho-2,'k')
    plot(4*rho-3,rho*0,'k')
hold off
for k=1:length(rvec)
    z=rvec(k)*exp(i*theta);
    zeta= (z.^2 - (236/151)*z + (85/151)) ./ ((70/151)*z.^2 +
 (44/151)*z - (48/151));
    hold on
        plot(real(zeta),imag(zeta))
    hold off
end

for k=1:length(tvec)-1
    z=rho*exp(i*tvec(k));
    zeta= (z.^2 - (236/151)*z + (85/151)) ./ ((70/151)*z.^2 +
 (44/151)*z - (48/151));
    hold on
        plot(real(zeta),imag(zeta))
    hold off
end

axis([-5 1 -3 3])
axis square
```



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