Math 425 - Spring 2013, Quiz 4, February 15, 2013, Instructor: S. Friedland
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**Show** all work. **Unjustified** answer yields no credit.
1. (6 pts) Find all roots of $z^3 + 1 = 0$.
2. (4 pts) Let $\mathbb{F}$ be a field. Assume that $A, B \in \mathbb{F}^{n\times n}$ are similar matrices. Show that $A$ and $B$ have the same characteristic polynomial.

1. $(z^3+1) = (z+1)(z^2-z+1) = 0$

First root $z=-1$, other two roots

$z^2-z+1=0$ $\quad z_{2,3} = \frac{1 \pm \sqrt{1^2-4}}{2} = \frac{1\pm\sqrt{-3}}{2} = \frac{1 \pm i\sqrt{3}}{2}$

$\frac{1}{2} \pm i\frac{\sqrt{3}}{2}$, $z_2 = \frac{1}{2} + i\frac{\sqrt{3}}{2}$, $z_3 = \frac{1}{2} - i\frac{\sqrt{3}}{2}$

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2. $B = TAT^{-1}$. Char pol of $B$

$\det(\lambda I - B) = \det(\lambda I - TAT^{-1}) =$

$\det(T(\lambda I - A)T^{-1}) = \det(T)\det(\lambda I - A)\det T^{-1}$

$\det(T)\det(T^{-1}) = \det(TT^{-1}) = \det I_n = 1$

Hence $\underline{\det(\lambda I - B) = \det(\lambda I - A)}$