Math 532: Quiz 8, Spring 2011

Show ALL Work Name ______________________

(1) For each part below, the function $f(x, y)$ is defined as follows. First f rotates (x, y) about the point $A = (1, 3)$ by $\pi/2$ and then it takes the result and rotates it about the point $B = (-1, 1)$ by π. Thus, we can view f as being $R_{\pi,B}R_{\pi/2,A}$. As usual, all rotations are counter-clockwise. (Some information is on the back of this quiz.)

(a) Calculate $f(3, 0)$.

Answer: [ ]

(b) Find a point (x_0, y_0) satisfying $f(x_0, y_0) = (x_0, y_0)$.

(x_0, y_0): [ ]

Translation and Rotation Information

(Most of this you do not need for this quiz.)

Theorem: *Let α and β be real numbers (not necessarily distinct), and let A and B be points (not necessarily distinct). If $\alpha + \beta$ is not an integer multiple of 2π, then there is point C such that $R_{\beta,B}R_{\alpha,A} = R_{\alpha+\beta,C}$. If $\alpha + \beta$ is an integer multiple of 2π, then $R_{\beta,B}R_{\alpha,A}$ is a translation.*

$$T_{(a,b)} = \begin{pmatrix} 1 & 0 & a \\ 0 & 1 & b \\ 0 & 0 & 1 \end{pmatrix}$$

$$R_{\theta,(x_1,y_1)} = \begin{pmatrix} \cos(\theta) & -\sin(\theta) & x_1(1-\cos(\theta)) + y_1\sin(\theta) \\ \sin(\theta) & \cos(\theta) & -x_1\sin(\theta) + y_1(1-\cos(\theta)) \\ 0 & 0 & 1 \end{pmatrix}$$

$$T_{(a,b)} = R_{\pi,(a/2,b/2)}R_{\pi,(0,0)}$$