

Name: \_\_\_\_\_

Show **ALL** work for credit; be neat. Calculators can be used for graphing and calculating only. Give exact answers when possible.

1. Find the Jacobian and draw the regions  $R$  (in  $xy$ -plane) and  $T$  (in the  $st$ -plane). The region  $R$  is in the  $xy$ -plane that corresponds to the region  $T = \{(s, t) | 0 \leq s \leq 3, 0 \leq t \leq 2\}$  under the change of variables (transformation)  $x = 2s - t, y = s + 3t$ . The Jacobian is, of course, the Jacobian of the same change of variables (transformation).

2. Use the given transformation to evaluate  $\int \int_R xy^2 dA$  where  $R$  is the region in the **FIRST** quadrant bounded by the lines  $y = x$  and  $y = 4x$  and the hyperbolas  $xy = 1$  and  $xy = 3$  and the transformation is  $x = s/t, y = t$ . Also explicitly draw  $R$  and  $T$ , the region in the  $st$  plane that maps to  $R$  in the  $xy$  plane by this transformation. Clearly label the Jacobian of the transformation.