Math 223

Week 10 Homework due Tuesday, November 2

**Sections 12.8 and 13.1**

**Section 12.8, problems 3, 7, 9, 15, 19, 21**

**Hints:**

9. The region $S$ describes the range of values of $(u, v)$.

15. You must decide on the range of values of $(u, v)$ which generates $R$. Sketch the transformation to decide this. Try sketching all $x$ and $y$ corresponding to $u = c$ and $v$ variable for various values of $c$. Then sketch all $x$ and $y$ corresponding to $v = c$ and $u$ variable for various values of $c$.

19. A natural change of variables is $u = x - 2y$ and $v = 3x - y$. Now solve for $x$ and $y$ in terms of $u$ and $v$ and decide on an appropriate range of values for $(u, v)$.

21. A natural change of variables is $u = y - x$ and $v = y + x$. Now solve for $x$ and $y$ in terms of $u$ and $v$ and decide on an appropriate range of values for $(u, v)$.

**Section 13.1, problems 5, 7, 9, 11, 13, 15, 17, 21, 23, 29, 32**

**Hints:**

29. Let $r(t) = (x(t), y(t))$ be position at time $t$. We are told that $r'(t) = (x(t)^2, x(t)+y(t)^2)$. Therefore you can calculate $r'(3)$. The particle's position at time $t = 3.01$ is exactly equal to $r(3.01)$, but unfortunately you are not provided with formulas for $x(t)$ and $y(t)$. However, an approximation to $r'(3.01)$ is $\frac{r(3.01)-r(3.00)}{.01}$. Now solve $r'(3.01) = \frac{r(3.01)-r(3.00)}{.01}$ for $r(3.01)$ to get an approximate value for $r(3.01)$.

31. Solve the differential equations by separation of variables (see Section 7.6).